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HANDBOOK
PREVENTIVE MAINTENANCE INSTRUCTIONS

RADIO RECEIVER
R-389/URR

(COLLINS RADIO CO.)

15 to 150 kc

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TABLE OF CONTENTS

Number	Title	Page
1.1(2)	SENSITIVITY CHECK	1
1.2(3)	IF SELECTIVITY	5
1.3(14)	CHECKING MECHANICAL SYNCHRONIZATION	11
1.4(4)	CHECKING AUDIO RESPONSE	17
2.1(5)	ALINEMENT OF 455 KC IF STAGES	21
2.2(5)	ALINEMENT OF RF STAGES	27
2.3(5)	ADJUSTMENT OF BANDSWITCHING MOTOR CONTROL SWITCH, FREQ CHANGE SLIP CLUTCH, DISC CLUTCH ASSEMBLY, AND REGULATED VOLTAGE HUM	37
2.4(10)	OPERATION	41
3.1(1)	RADIO RECEIVER R-389/URR	45

INTRODUCTION

1. PURPOSE: This handbook establishes standardized work methods and simplified step-by-step job instructions for the preventive maintenance of this equipment. The individual job instructions, in the form of "Routines", are presented simply and logically to permit their ready use by maintenance personnel. Adequate performance standards are included.

2. SCOPE: These job instructions are applicable to and will be utilized by all activities maintaining the equipment.

3. SPECIAL INSTRUCTIONS: This handbook will be utilized as a portion of the standardized communications-electronics maintenance inspection system. Personnel utilizing this handbook shall notify supervisory personnel immediately if satisfactory performance cannot be obtained.

TABLE I

SCHEDULE FOR ACCOMPLISHMENT OF ROUTINES

(Intervals are in days, for example "7" means "every seventh day.")

Routine Number	CONTINUOUS OPERATION				TACTICAL OPERATION				STANDBY OPERATION			
	Tem-perate	Arctic	Tropic	Desert	Tem-perate	Arctic	Tropic	Desert	Tem-perate	Arctic	Tropic	Desert
1.1 (2)	30	15	7	7	60	30	7	7	90	45	7	7
1.2 (3)	30	15	7	7	60	30	7	7	90	45	7	7
1.3 (14)	90	15	7	7	90	30	7	7	90	45	7	7
2.1 (5)	*	*	*	*	*	*	*	*	*	*	*	*
2.2 (5)	*	*	*	*	*	*	*	*	*	*	*	*
2.3 (5)	*	*	*	*	*	*	*	*	*	*	*	*
2.4 (10)	*	*	*	*	*	*	*	*	*	*	*	*
3.1 (1)	30	15	7	7	60	30	7	7	90	45	7	7

* Accomplishment to be directed by maintenance supervisor when results of performance tests indicate the need therefore.

SECTION I

PERFORMANCE ROUTINES

PERFORMANCE ROUTINE - SENSITIVITY CHECK

1. GENERAL INFORMATION

a. The purpose of this routine is to determine receiver sensitivity for Radio Receiver, R-389/URR.

b. The approximate time required to do this routine is 60 minutes.

c. The receiver and signal generator will be warmed up for 30 minutes before starting this routine.

d. Report to the maintenance supervisor if the receiver fails to check out according to the instructions in this routine.

2. TEST EQUIPMENT REQUIRED

a. Signal Generator AN/URM-25D

b. Output Meter TS-585/U.

c. Electronic Multimeter TS-505/U.

3. MATERIALS REQUIRED

a. 125 ohm resistor for dummy antenna (if used with BALANCED antenna input).

b. Five inch wire suitable for use as a jumper.

4. PROCEDURE

a. Set front panel controls as follows:

(1) Set IF BANDWIDTH switch according to Table II.

TABLE II

IF BANDWIDTH SWITCH SETTINGS

Band	Range (kc)	Set IF BANDWIDTH to KC
A	15-27	1
B	27-55	2
C	55-117	4
D thru G	117-1500	8

(2) FUNCTION switch to MGC.

(3) RF GAIN control to maximum.

(4) BFO switch to OFF.

(5) LIMITER to 0.

(6) AUDIO RESPONSE control to WIDE.

b. Set up test equipment as follows (see figure 1-1):

(1) Remove antenna from rear panel. Connect Signal Generator AN/URM-25D output in series with dummy antenna (125 ohm resistor) to the ANTENNA BALANCED 125 OHM jack on the receiver.

(2) Place a jumper between remaining pin of the ANTENNA BALANCED 125 OHM jack and GND on the rear panel of the receiver.

(3) Connect lead from ground terminal on signal generator to GND (terminal 9) on the rear panel of the receiver. Connect signal generator power cord to a 115 vac source.

(4) Adjust Output Meter TS-585/U DECIBELS and MULTIPLIER knobs for convenient reference level and connect it to LOCAL AUDIO terminals 6 and 7 on the rear panel of the receiver.

(5) Set Electronic Multimeter TS-505/U for negative dc voltage and connect one lead to the DIODE LOAD terminal 15 or 16, and connect the other lead to GND on the rear panel. Plug the meter power cord into a 115 vac supply.

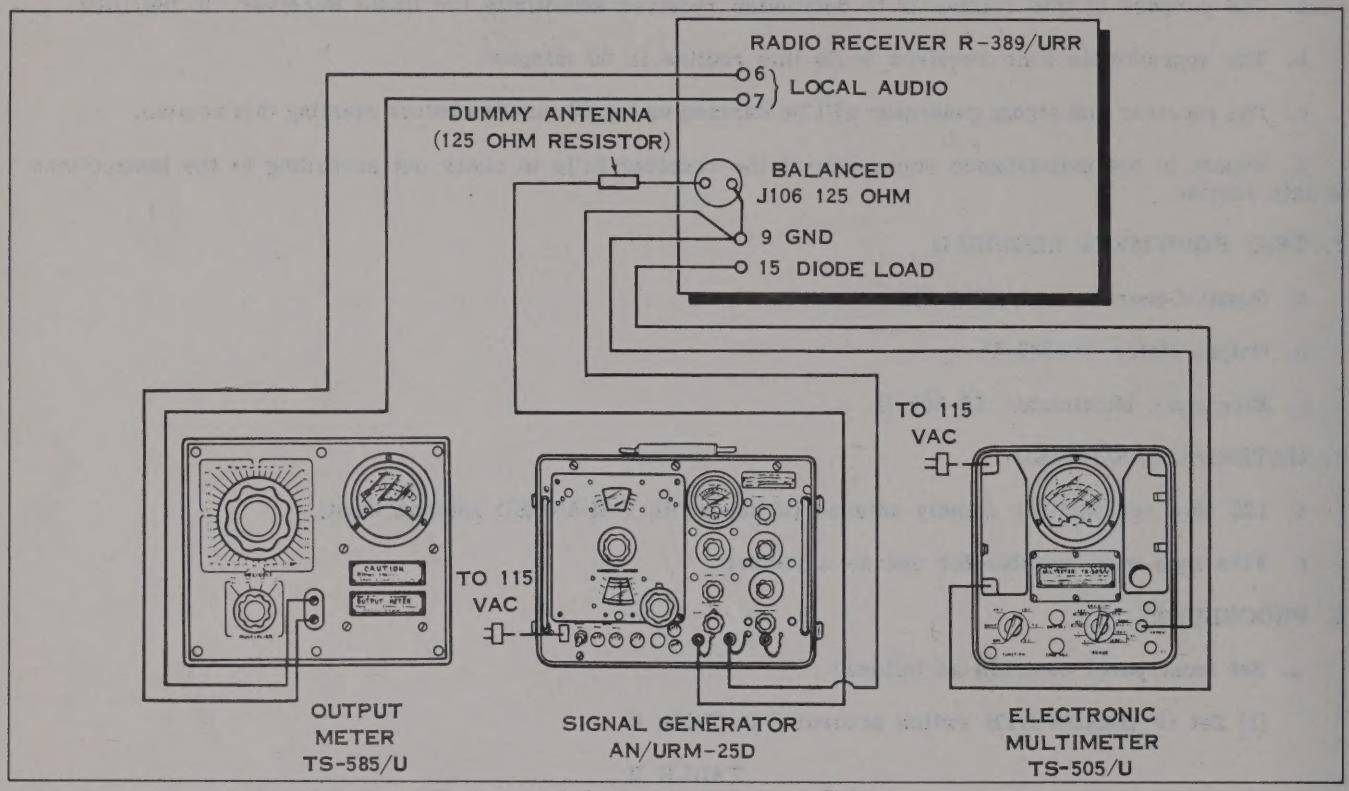

Figure 1-1. Test Equipment Setup

c. Sensitivity measurement should be made at both ends and the middle of each band. See Table III for the bands and their frequencies.

d. Sensitivity measurement is accomplished as follows:

(1) Tune receiver to lowest frequency on band A (15 KC) by turning FREQ CHANGE knob.

(2) Adjust signal generator output with no modulation for a multimeter reading of 7 volts.

(3) Adjust signal generator frequency control around 15 KC for the maximum multimeter indication, then readjust signal generator output for 7 volts. Note reading on signal generator attenuator dials.

(4) Adjust receiver LOCAL GAIN control for a reading of 1 milliwatt on the output meter.

(5) Turn the signal generator 400 cycle modulation on, and adjust to 30 percent modulation. Adjust attenuator dials for a reading of 10 milliwatts on the output meter.

(6) Turn modulation off and recheck for 1 milliwatt reading on the output meter.

(7) Turn modulation on again. Reading on output meter should be 10 milliwatts. Use LOCAL GAIN control in combination with signal generator attenuation to accomplish proper ratio. Repeat checks until proper 1 to 10 ratio is established.

(8) Observe signal generator attenuator reading. This is receiver sensitivity in microvolts at 15 KC. The reading for this and all other frequencies should not be less than 10 microvolts.

(9) Tune receiver to 21 KC (midway between 15 KC and 27 KC) and repeat steps (1) through (8) above. Then tune to 27 KC, and repeat steps (1) through (8) above.

(10) Table III shows the bands and their frequency ranges. Check the sensitivity of all bands in the same manner as described in steps (1) through (9) above.

TABLE III

RECEIVER BANDS AND BAND FREQUENCY RANGES

Band	Approximate Frequency Range in Kilocycles
A	15-27
B	27-55
C	55-117
D	117-242
E	242-500
F	500-865
G	865-1500

e. Disconnect test equipment as follows:

(1) Remove Signal Generator AN/URM-25D output lead and dummy antenna from the ANTENNA BALANCED 125 OHM jack.

(2) Remove jumper between ANTENNA BALANCED 125 OHM jack and GND. Replace antenna.

(3) Remove ground lead between signal generator ground terminal and GND (terminal 9) on the receiver rear panel. Remove signal generator power cord from 115 vac source.

(4) Remove Output Meter TS-585/U leads from LOCAL AUDIO terminals 6 and 7 on the rear panel of the receiver.

(5) Remove leads of Multimeter TS-505/U from DIODE LOAD terminals (15 or 16), and GND on the rear panel. Disconnect meter power cord from 115 vac source.

f. Replace antenna.

g. Turn FUNCTION switch to OFF, or to STANDBY if the equipment is to be used following this routine.

PERFORMANCE ROUTINE - IF SELECTIVITY

1. GENERAL INFORMATION

   a. The purpose of this routine is to determine IF selectivity for Radio Receiver R-389/URR.

   b. The approximate time required to complete this routine is 90 minutes.

   c. The receiver will be warmed up 15 minutes before starting this routine.

   d. Report to maintenance supervisor if this routine does not show proper results.

2. TEST EQUIPMENT REQUIRED

   a. Electronic Multimeter TS-505/U.

   b. Signal Generator AN/URM-25D

3. MATERIALS REQUIRED

   a. 600 ohm headset.

   b. 125 ohm, 1 watt resistor (for dummy antenna).

   c. Five inch wire suitable for use as a jumper.

4. PROCEDURE

   a. Before checking IF response, preliminary checks must be made as follows:

      (1) Check to see if all controls operate freely without binding.

      (2) Remove bottom cover of receiver to gain access to audio frequency subchassis. (See figures 1-2 and 1-4.)

      (3) Turn FUNCTION switch to MGC. Measure B+ voltage with Multimeter TS-505/U. Place the positive (+) lead on the 180 vdc jack (J601) through the right side of the receiver, (looking at the bottom) and attach negative (-) lead to terminal 9 marked GND on the rear panel. The meter should read 175 to 185 volts.

WARNING

Avoid contact with the B+ 180 VDC jack (J601) when the receiver is turned on. The high voltage present at this jack is dangerous to personnel.

      (4) While receiver is open, make a visual check to determine that all tubes and dial lights are lit. Check to see if antenna is connected.

      (5) Plug 600-ohm headset in the PHONES jack on the front panel.

      (6) Turn FREQ CHANGE control until a strong signal is heard in the headset. Adjust FREQ CHANGE control for the highest indication on the CARRIER LEVEL meter on the front panel of the receiver.

      (7) Set BFO switch at ON. Turn BFO PITCH control through its entire range, from -3 to +3. A zero beat should occur when the BFO PITCH control is at the zero position.

NOTE

A high pitched "whine" should be heard in the phones at the -3 and +3 positions of the BFO PITCH control. As 0 is approached with the control, this whine should die down in amplitude and pitch, disappear entirely at 0, and start up again as the dial is moved past 0. The null in the whine at 0 is known as a zero beat.

      (8) Turn the FUNCTION switch to OFF.

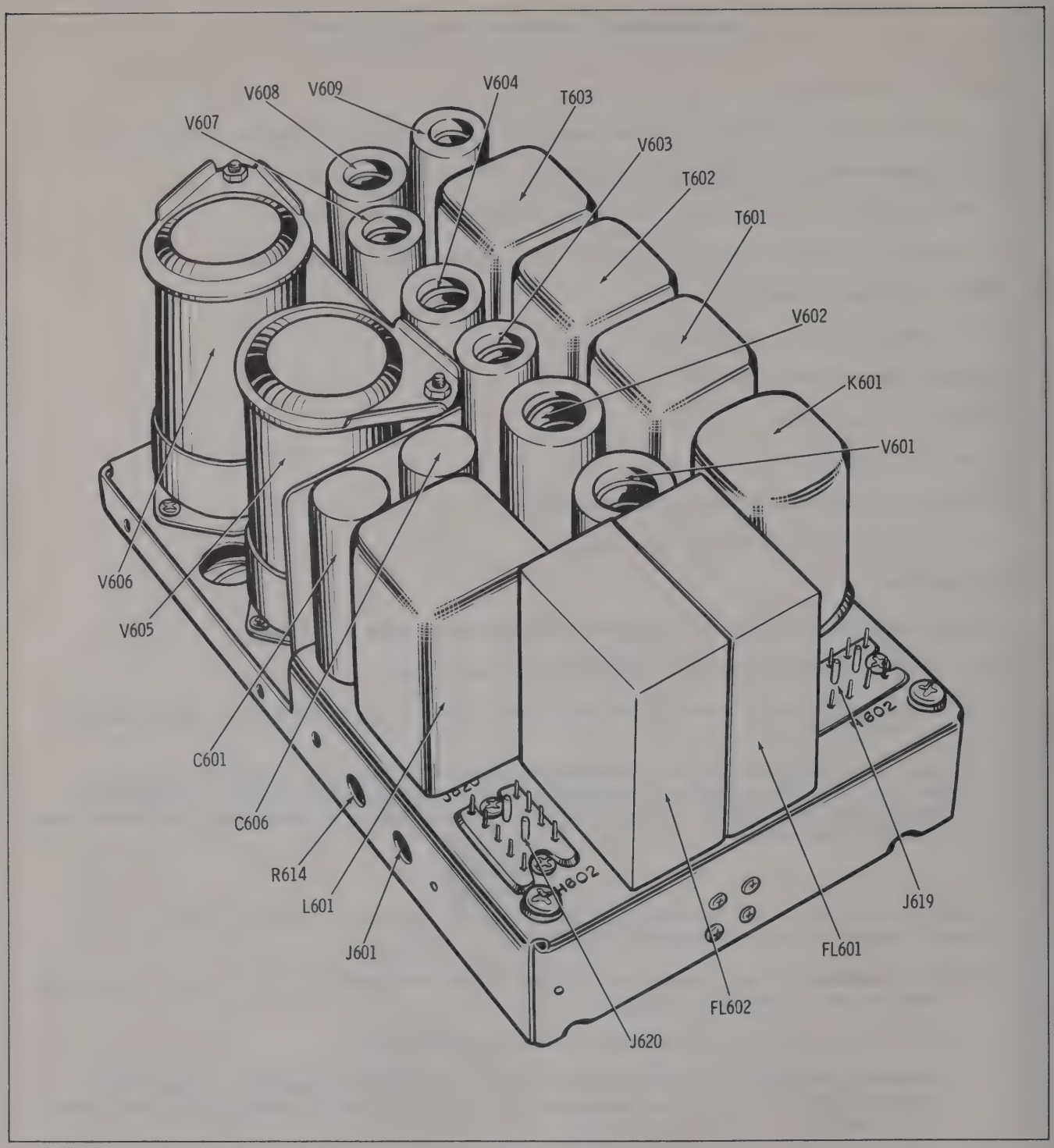

Figure 1-2. AF Subchassis - Top View

b. Connect test equipment as follows:

(1) Connect one lead of the Electronic Multimeter TS-505/U to terminals 15 or 16 (DIODE LOAD) and the other to ground at the terminal strip on the rear panel. Set the meter for negative voltage on the 10 volt scale. Plug multimeter power cord into 115 vac source.

(2) Disconnect antenna. Connect Signal Generator AN/URM-25D output in series with 125 ohm resistor. Attach 125 ohm resistor to ANTENNA BALANCED 125 OHM receptacle (J106).

(3) Connect lead from ground terminal on signal generator to GND on rear panel of receiver.

(4) Place a jumper between one pin of the ANTENNA BALANCED 125 OHM jack and GND on the rear panel of the receiver. Plug the signal generator power cord into 115 vac source.

(5) Tune the signal generator to a frequency of 400 kc. Adjust the attenuator control on the signal generator for minimum output.

NOTE

The test equipment setup shown in figure 1-1 is the same for this routine with the exception of the Output Meter, TS-585/U, which is not used in this routine.

c. Set receiver and test equipment controls as follows:

(1) IF BANDWIDTH switch to .1 KC.

(2) FUNCTION switch to MGC.

(3) RF GAIN control to 10.

(4) FREQ RANGE switch to 15-500 KC.

(5) FREQ CHANGE knob until the frequency-indicator reads exactly 400 kc.

(6) Increase the signal generator output until an indication is obtained on the meter.

NOTE

Table IV, IF selectivity readings, shows the frequency ranges for corresponding db points (or voltage readings on the meter) for different settings of the IF BANDWIDTH switch. This table should be used with figure 1-3 to determine the IF selectivity tolerances.

(7) Tune the signal generator to obtain the highest output indication.

(8) Increase or decrease signal generator output as necessary to give an indication of 7 volts on the meter.

d. Set the IF BANDWIDTH switch to 2 KC and proceed as follows:

(1) Adjust the signal generator output attenuator, and if necessary, adjust the RF GAIN control to obtain a reference voltage indication of 7 volts on the meter.

(2) Turn the FREQ CHANGE knob on the receiver toward a lower frequency until the meter indicates 5 volts. The frequency-indicator should read somewhere between 399 kc and 400 kc.

(3) Turn the FREQ CHANGE knob toward a higher frequency, passing through the 7 volt indication at 400 kc, until the meter again indicates 5 volts. The frequency-indicator should read somewhere between 400 kc and 401 kc.

NOTE

The voltage obtained in steps (2) and (3) above, represents 3-db points, and the frequency-indicator dial readings should lie between 399 kc and 401 kc. The total difference between the two frequencies should, therefore, not exceed 2 kc.

(4) Turn FREQ CHANGE knob on the receiver toward a lower frequency until the meter indicates 3.5 volts. The frequency-indicator dial should read between 398.75 kc and 400 kc.

(5) Turn FREQ CHANGE knob back to 400 kc, and continue to higher frequency until meter again shows 3.5 volts. The frequency indicator dial should read between 400 kc and 401.25 kc.

NOTE

The voltage obtained in steps (4) and (5) represents 6-db points, and the frequency-indicator dial readings should lie between 398.75 and 401.25 kc. The total difference between the two frequencies should not exceed 2.5 kc.

TABLE IV

IF SELECTIVITY READINGS

Db Point Below 7-Volt Reference	Meter Reading	IF BANDWIDTH Switch Setting	Frequency-Indicator Reading (Kc)	Total Maximum Difference Allowable in Frequency Change
0-db	7-volts	2	400	none
3-db	5-volts	2	399-401	2 kc
6-db	3.5-volts	2	398.75-401.25	2.5 kc
0-db	7-volts	4	400	none
3-db	5-volts	4	398-402	4 kc
6-db	3.5-volts	4	397.75-402.25	4.5 kc
0-db	7-volts	8	400	none
3-db	5-volts	8	395.4-404.6	9.2 kc
6-db	3.5-volts	8	394.8-405.2	10.4 kc

e. With the IF BANDWIDTH switch in the 4 KC position, proceed as follows:

(1) Repeat the procedure in step 4.d (2). The frequency-indicator dial should read between 398 kc and 400 kc.

(2) Repeat the procedure in step 4.d (3). The frequency-indicator dial should read between 400 kc and 402 kc.

NOTE

The frequency-indicator dial should read between 398 kc and 402 kc for 3-db points. The total difference between the two frequencies for the 3-db points should not exceed 4 kc.

(3) Repeat the procedure in step 4.d (4). The frequency-indicator dial should read between 397.75 kc and 400 kc.

(4) Repeat the procedure in step 4.d (5). The frequency-indicator dial should read between 400 kc and 402.25 kc.

NOTE

The readings for the 6-db points should lie between 397.75 kc and 402.25 kc. The total difference between the two frequencies should not exceed 4.5 kc. Compare readings with ranges given in Table IV.

f. With the IF BANDWIDTH switch in the 8 KC position, proceed as follows:

(1) Repeat the procedure in step 4.d (2). The frequency-indicator dial should read between 395.4 kc and 400 kc.

(2) Repeat the procedure in step 4.d (3). The frequency-indicator dial should read between 400 kc and 404.6 kc.

NOTE

The frequency-indicator dial should read between 395.4 kc and 404.6 kc for 3-db points. The total difference between the two frequencies for 3-db points should not exceed 9.2 kc.

(3) Repeat the procedure in step 4.d (4). The frequency-indicator dial should read between 394.8 kc and 400 kc.

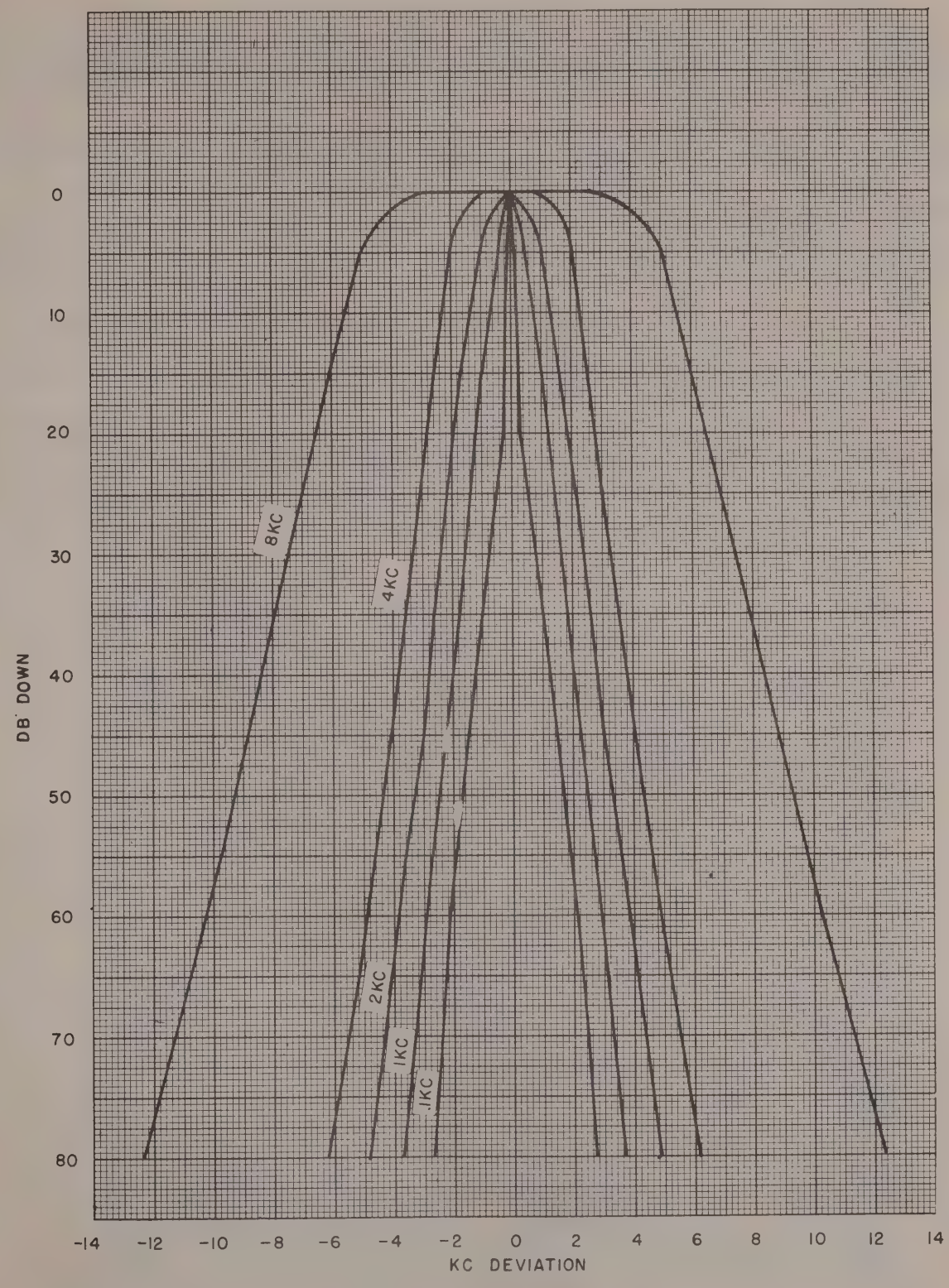

Figure 1-3. IF Selectivity Curve

(4) Repeat the procedure in step 4.d (5). The frequency-indicator dial should read between 400 kc and 405.2 kc.

NOTE

The frequency-indicator readings for the 6-db points should lie between 394.8 kc and 405.2 kc. The total difference between the two frequencies should not exceed 10.4 kc. Compare readings with those in Table IV.

g. Compare all dial readings obtained above (with different settings of the IF BANDWIDTH switch) with the readings given in Table IV and the chart of figure 1-3.

h. Disconnect test equipment as follows:

(1) Remove Signal Generator AN/URM-25D output lead and dummy antenna from the ANTENNA BALANCED 125 OHM jack.

(2) Remove jumper between ANTENNA BALANCED 125 OHM jack and GND. Replace antenna.

(3) Remove ground lead between signal generator ground terminal and GND (terminal 9) on the receiver rear panel. Disconnect signal generator power cord from 115 vac source.

(4) Remove leads of Multimeter TS-505/U from DIODE LOAD terminal (15 or 16) and GND on the rear panel of the receiver. Disconnect multimeter power cord from 115 vac source.

i. Replace dust covers and turn FUNCTION switch to OFF, or to STANDBY if the equipment is to be used following this routine.

PERFORMANCE ROUTINE - CHECKING MECHANICAL SYNCHRONIZATION

1. GENERAL INFORMATION

a. The purpose of this test is to determine if radio receiver R-389/URR has proper mechanical synchronization.

b. The average time required to do this routine is 3 hours.

c. No warm up time will be required on the receiver prior to this routine.

d. Report malfunctions, failures or unsatisfactory results to the maintenance supervisor for corrective action.

2. TEST EQUIPMENT REQUIRED

a. None.

3. MATERIALS REQUIRED

a. Six inch ruler.

b. Common tools used for disassembly procedures.

c. A one and one-half foot section of stiff bare wire.

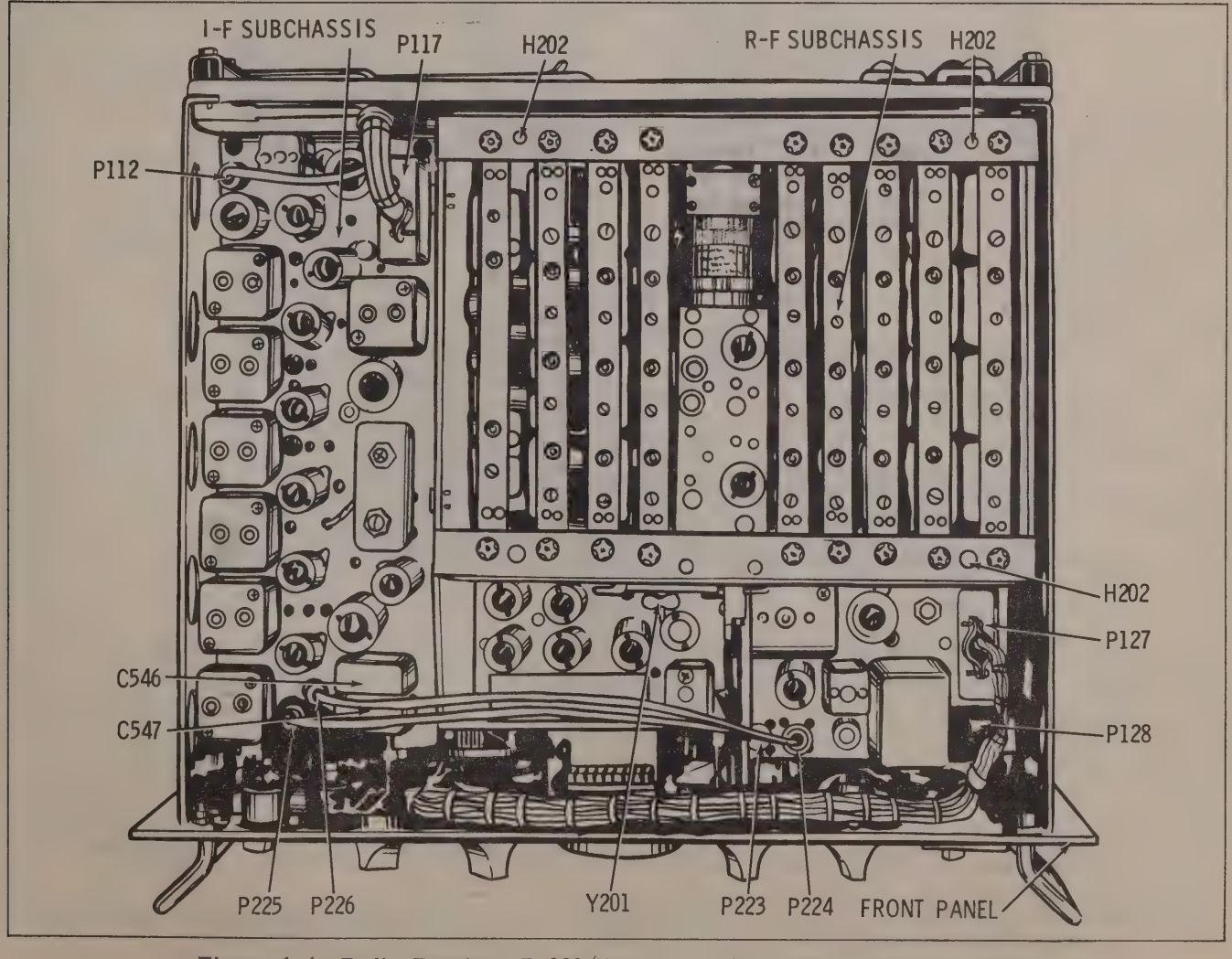

Figure 1-4. Radio Receiver R-389/URR, Top View, Dust Covers Removed

4. PROCEDURE

a. Remove top and bottom dust covers and shields from the receiver.

b. Prior to performing this routine, disassembly of the RF subchassis from the equipment is required. Disassemble as follows:

(1) Remove coaxial connectors P209, P210, and P211 (Figure 1-5) from J109, J110, and J111 on the main frame. Remove P129 from its jack.

(2) Disconnect coaxial connector P230 from P730 (Figure 1-5) at the vfo.

(3) Remove coaxial cables terminated by P223 and P224 (Figure 1-4) from the receiver.

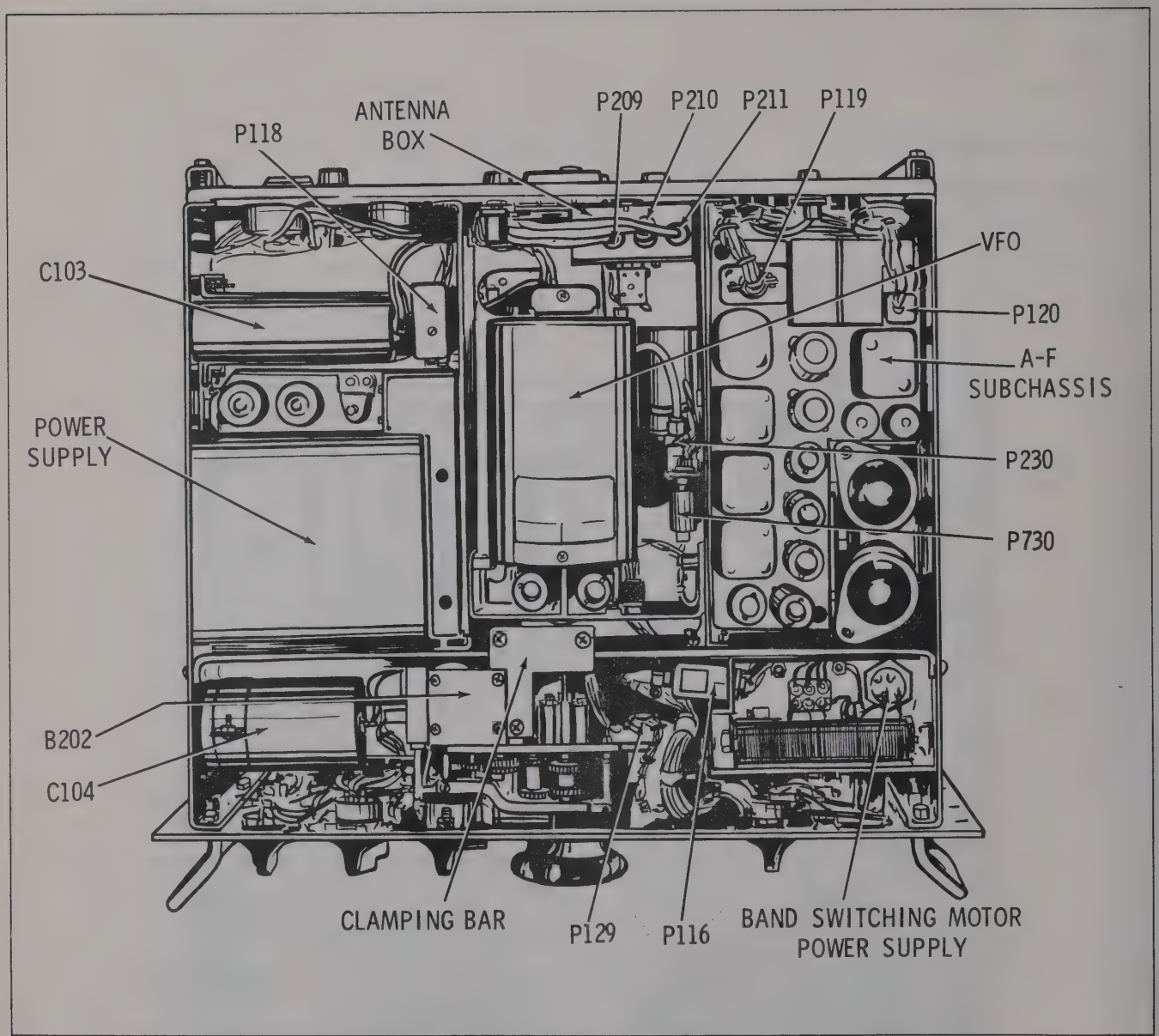

Figure 1-5. Radio Receiver R-389/URR, Bottom View, Dust Covers Removed

(4) Remove the clamping bar (Figure 1-5) located between tuning motor B202 and RF switching motor control S205, by removing the screws.

(5) Remove also, the two round head holding screws in the main frame side panel and the similar screw in the rear panel.

(6) Remove the front panel as described below:

(a) Disconnect plugs P127, P128 and P129 (Figures 1-4, 1-5, and 1-6).

(b) Place wooden blocks under the receiver main frame, in back of the front panel, so that the panel is clear of the bench and the receiver is tilted backwards.

(c) Position the BFO PITCH control at 0.

(d) Position the IF BANDWIDTH so that the coupler that secures the control shaft (in back of the front panel) is accessible.

(e) Note positions of the following controls before proceeding:

FREQ RANGE setting
FREQ CHANGE dial reading
BFO PITCH control setting
IF.BANDWIDTH control setting

(f) Tighten the DIAL LOCK and turn the FREQ CHANGE to slip the clutch. When the hole in the inside flange of the knob (facing the receiver front plate) is in line with the set screw holding the collar, loosen the set screw. Remove knob. (See Figure 2-7.)

(g) Loosen the set screws in the MOTOR TUNE and DIAL LOCK knobs. Remove knobs.

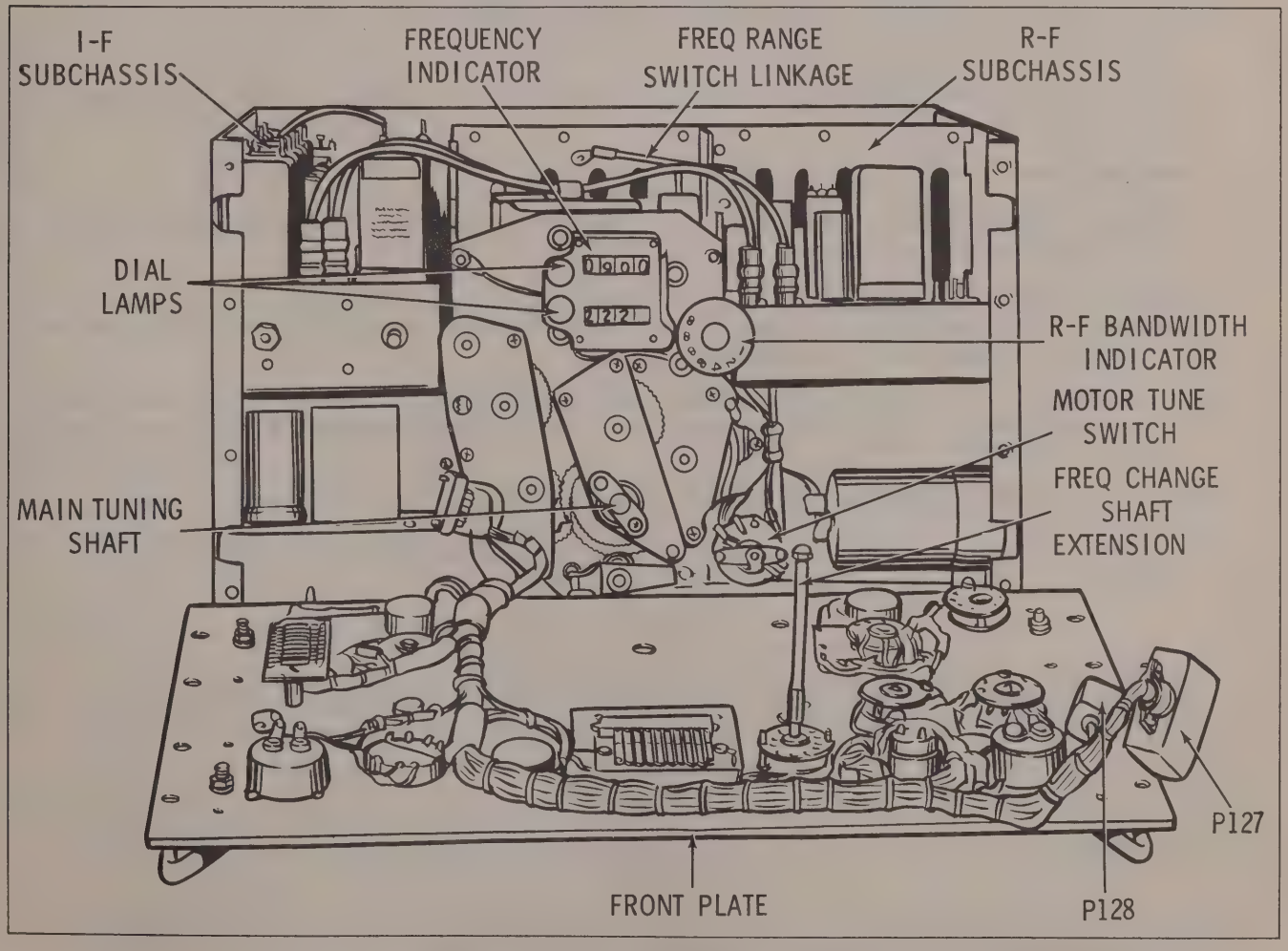

Figure 1-6. Radio Receiver R-389/URR, Front Panel Removed

(h) Loosen the set screws in the coupler for the BFO PITCH and IF BANDWIDTH controls, behind the front panel.

(i) Loosen the set screws in the shaft sleeve of the FREQ RANGE control.

(j) Remove the eight flat head panel mounting screws.

(k) Carefully pull the panel straight out to clear the control shafts, and lay the panel face down in front of the main frame as shown in Figure 1-6.

(7) Remove the IF subchassis as described below:

(a) Disconnect coaxial connectors P112, P225 and P226 from J512,J525 and J526. (See Figure 1-4.)

(b) Disconnect plug P117 from J517. (See Figure 1-4.)

(c) Loosen the three green color-coded captive screws, one at the front-center of the IF subchassis, and two at the rear corners.

(d) Lift the subchassis straight up from the receiver. Do not disturb the position of the BFO PITCH and IF BANDWIDTH tuning shafts after the subchassis is removed from the receiver, unless necessary for performing tests.

(8) Loosen the captive screws in the base of the RF subchassis. One captive screw is reached through the hole between tube V213 and crystal Y201 (Figure 1-4); the remaining screws are reached through the holes marked H202 at the front and rear of the tuning racks (Figure 1-4.)

(9) Make sure that the coaxial connector plugs are free to travel through the holes in the main frame.

(10) Pull the RF subchassis slightly forward to disengage the vfo coupling, and lift the subchassis straight up.

c. Check mechanical synchronization as follows:

(1) Replace knob on FREQ CHANGE shaft. Turn the FREQ CHANGE to a reading of 14 kc on the lower frequency-indicator dial.

(2) Carefully measure from the top of the vfo output circuits slug rack (Figure 1-7) to the top of the lead-screw bearing retainer bar. This distance should be exactly 1.656 inches, as marked on the rear plate of the RF subchassis.

(3) Measure the distance from the top of the injection mixer circuits to the top of the lead-screw bearing retainer bar. This distance should be exactly .656 inch, as marked on the rear plate of the RF subchassis.

(4) Turn the FREQ CHANGE knob for a reading of 28.8 kc on the frequency-indicator dial.

(5) Check to see whether band A slug rack is at the extreme top of its travel on its two lead screws.

NOTE

The slug rack is at the extreme top of its travel if a stiff wire can be passed through the holes provided in the front and rear chassis plates, through the larger hole in the slug rack slide which travels on the lead screw, and through the small hole in the shaft of the lead screw.

(6) Turn FREQ CHANGE knob to obtain a reading of 57.8 kc (on the lower dial). Check the position of band B slug rack to see that the rack is at the top of its travel as explained in the NOTE above.

NOTE

The readings below all appear on the lower dial. The slug rack should be at the top of its travel.

(7) Set the dial at 123.8 kc and check the position of band C slug rack.

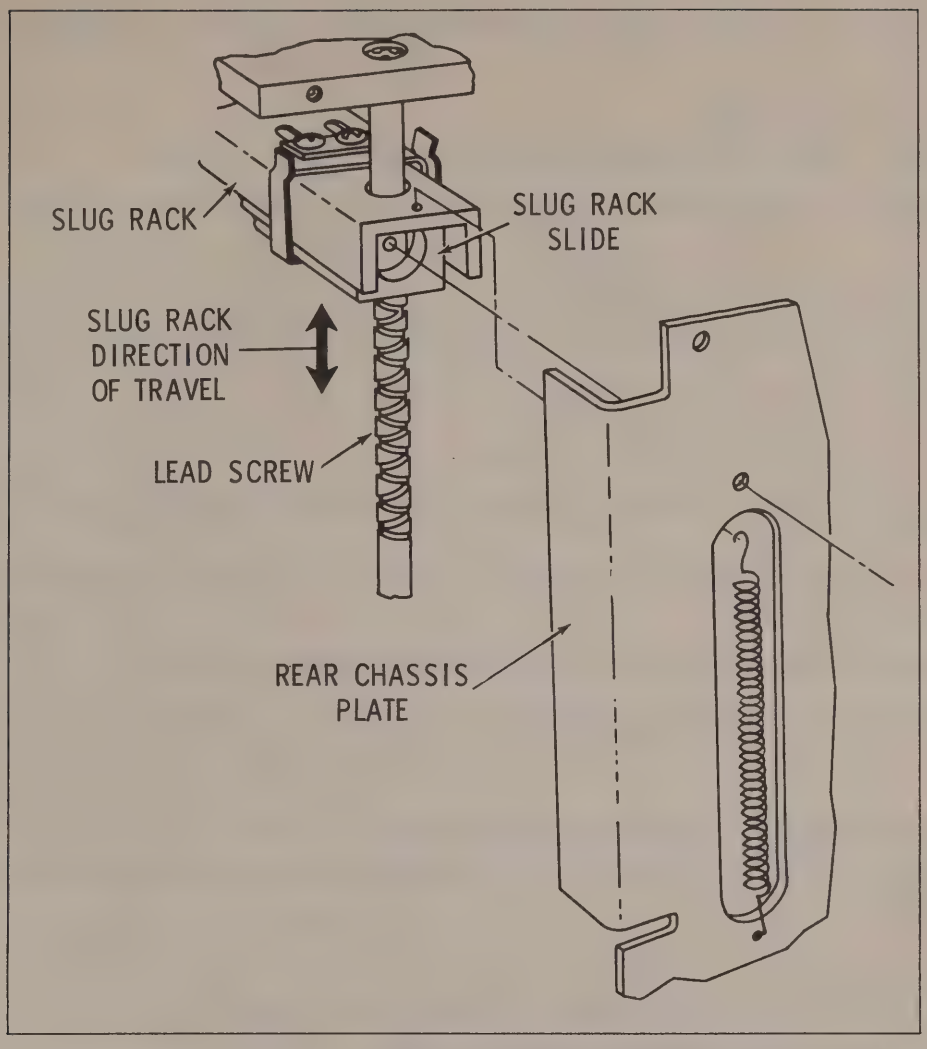

Figure 1-7. Section of Tuning Slug Rack

(8) Set the dial at 219 kc and check the position of band F slug rack.

(9) Set the dial at 253 kc and check the position of band D slug rack.

(10) Set the dial at 521 kc and check the position of band E slug rack.

(11) Set the dial at 545 kc and check the position of band G slug rack.

d. Reassemble the receiver as follows:

(1) Coat Oldham coupler flange lightly with grease and replace the notched coupling washer on the flange.

(2) Obtain the aid of a second person to pull coaxial cables completely through the holes in the main frame.

(3) Place the RF subchassis in a position slightly forward to its correct position, then push back into place slowly and firmly to secure coupling with the vfo.

(4) Replace captive screws in the base of the unit. Place them through the hole between V213 and crystal Y201 (Figure 1-4); Return the remaining screws through the holes marked H202 at the front and rear of the tuning racks (Figure 1-4).

(5) Reassemble IF subchassis to the receiver as described below:

(a) Place IF subchassis into its position on the main frame.

(b) Tighten the three green color-coded captive screws to secure the subchassis to the main frame.

(c) Plug in P117 to J517.

(d) Plug in connectors P112, P225 and P226 into J512, J525 and J526.

(6) Reassemble the front panel to the receiver as described below:

NOTE

Throughout the reassembly compare settings of FREQ RANGE control, FREQ CHANGE dial, BFO PITCH control and IF BANDWIDTH control with the settings noted during disassembly.

(a) Carefully place the panel in position on the main frame.

(b) Replace the eight flat head panel mounting screws.

(c) Be sure the extension on the shaft of the FREQ RANGE control is properly seated. Tighten the set screws.

(d) Make sure the couplers of the BFO PITCH and IF BANDWIDTH controls are properly seated. Tighten the screws.

(e) Replace MOTOR TUNE and DIAL LOCK knobs. Tighten set screws.

(f) Replace FREQ CHANGE knob and tighten its set screw. Loosen the DIAL LOCK control to determine if the FREQ CHANGE knob will turn, and engages properly with the main tuning shaft.

(g) Connect plugs P127, P128 and P129 (Figures 1-4, 1-5 and 1-6).

(7) Place two roundhead holding screws in the main frame side panel and the similar screw in the rear panel.

(8) Replace the clamping bar and secure with its screws.

(9) Reassemble coaxial cables terminated by P223 and P224 (Figure 1-4).

(10) Plug in coaxial connector P230 to P730 at the vfo.

(11) Plug in coaxial connectors P209, P210 and P211 to J109, J110 and J111 on the main frame.

(12) Return P129 to its jack.

e. Return all dust covers and shields to the equipment.

PERFORMANCE ROUTINE - CHECKING AUDIO RESPONSE

1. GENERAL INFORMATION

   a. The purpose of this routine is to determine the audio response of Radio Receiver R-389/URR.

   b. The approximate time required to complete this routine is 60 minutes.

   c. The receiver will be warmed up for 1 hour before starting this routine.

   d. Report to maintenance supervisor if any parts of the routine do not show proper results.

2. TEST EQUIPMENT REQUIRED

   a. Audio Oscillator TS-382A/U.

   b. Spectrum Analyzer TS-723/U.

   c. Signal Generator AN/URM-25D

3. MATERIALS REQUIRED

   a. 600 ohm, 1 watt resistor.

   b. 125 ohm, 1 watt resistor (for dummy antenna).

4. PROCEDURE

   a. Set up test equipment as follows (see Figure 1-8):

      (1) Remove antenna from rear panel. Connect Signal Generator AN/URM-25D output in series with dummy antenna (125 ohm resistor) to the ANTENNA BALANCED 125 OHM jack on the receiver.

      (2) Place a jumper between remaining pin of the ANTENNA BALANCED 125 OHM jack and GND on the rear panel of the receiver.

      (3) Connect lead from ground terminal on signal generator to GND terminal on the rear panel of the receiver. Plug signal generator power cord into 115 vac source.

      (4) Tune the signal generator to a frequency of 1000 kc. Adjust the attenuator for minimum output.

      (5) Modulate the output of the signal generator at 30 percent.

      (6) Connect the output cable of the Audio Oscillator TS-382 A/U to the EXTERNAL MOD. terminals of the rf signal generator. Plug audio oscillator power cord into 115 vac source.

      (7) Connect a lead from the frame of the audio oscillator to the left-hand EXTERNAL MOD. terminal.

      (8) Turn the MODULATION switch on the rf signal generator to EXT.

      (9) Connect Spectrum Analyzer TS-723/U leads to each lead of the 600 ohm, 1 watt resistor, and then to terminals 6 and 7 (LOCAL AUDIO) of the terminal strip on the rear panel of the receiver. The resistor and spectrum analyzer leads are then in parallel, as shown in Figure 1-8.

   b. Set front panel controls of the receiver as follows:

      (1) IF BANDWIDTH switch to 8 KC.

      (2) AUDIO RESPONSE switch to WIDE.

      (3) LIMITER switch completely counterclockwise to 0.

      (4) FUNCTION switch to AGC.

      (5) FREQ RANGE switch to 500-1500 KC.

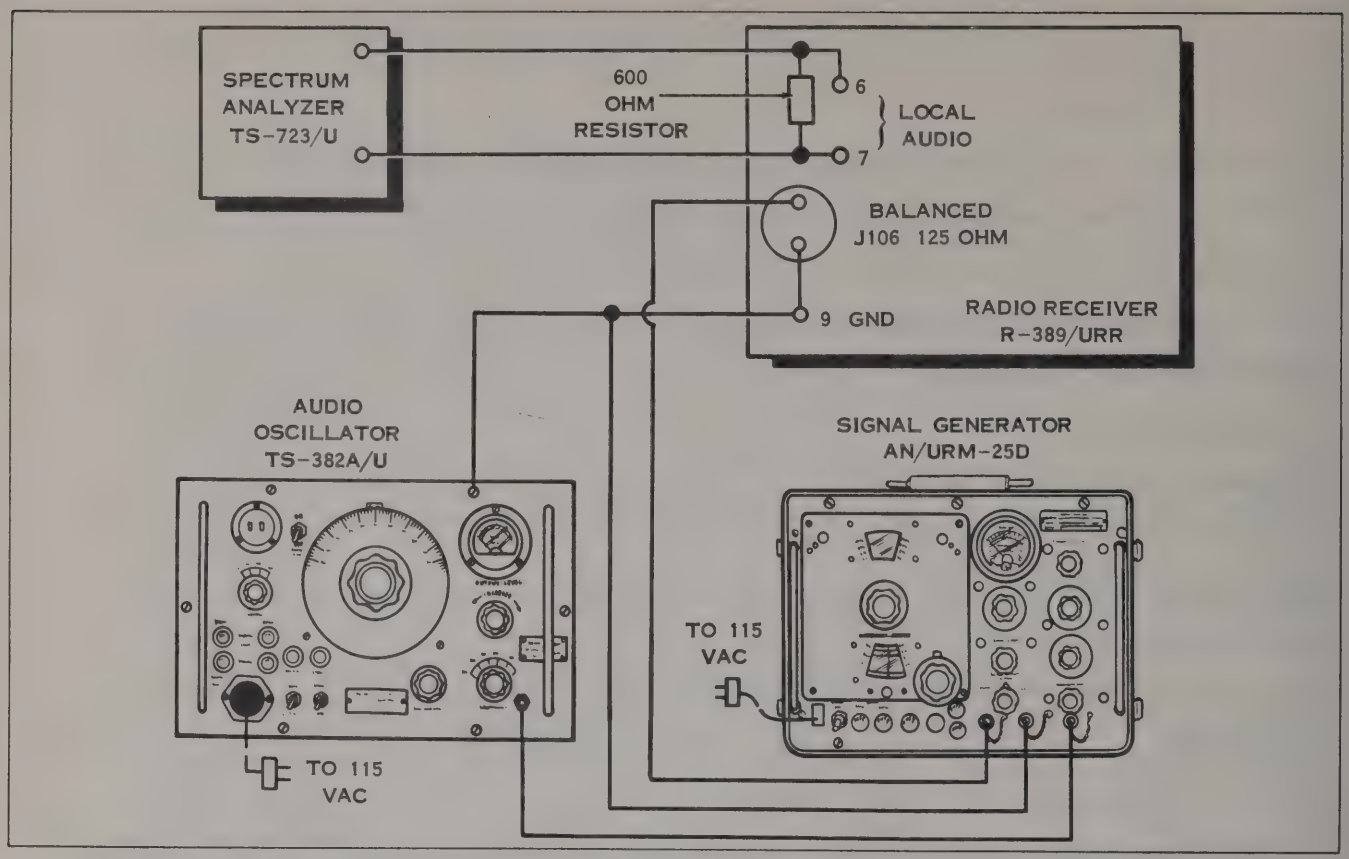

Figure 1-8. Test Equipment Setup

(6) Tune the FREQ CHANGE knob to the frequency of the signal generator (1000 kc).

NOTE

Figure 1-9 is a chart of Audio Response for the WIDE, MEDIUM and SHARP positions of the AUDIO RESPONSE switch. Record readings obtained so that comparison may be made between the correct results of Figure 1-9 and the results of the test.

c. Find WIDE audio response as follows:

(1) Set the audio oscillator frequency at 1000 cycles.

(2) Adjust the LOCAL GAIN control for a convenient db reference level on the spectrum analyzer meter.

(3) Note the db reading on the spectrum analyzer at 10-cycle intervals, from 30 to 100 cycles; at 100-cycle intervals, from 100 to 1000 cycles; and at 1000-cycle intervals, from 1000 to 10,000 cycles.

(4) Compare the readings obtained with those on the chart in Figure 1-9.

d. Repeat procedures of step 4.c above with the AUDIO RESPONSE switch in the MEDIUM position. Compare results with Figure 1-9.

e. Again repeat procedures of step 4.c above with AUDIO RESPONSE switch in SHARP position. Note db readings at 100-cycle intervals from 600 to 1000 cycles, and compare results with Figure 1-9.

f. Shift spectrum analyzer leads (with 600 ohm resistor still intact) to terminals 11 and 14 (LINE AUDIO) on the rear panel of the receiver. Repeat procedure of steps 4.c through 4.e, except to adjust LINE GAIN control for the db reference level instead of the LOCAL GAIN control.

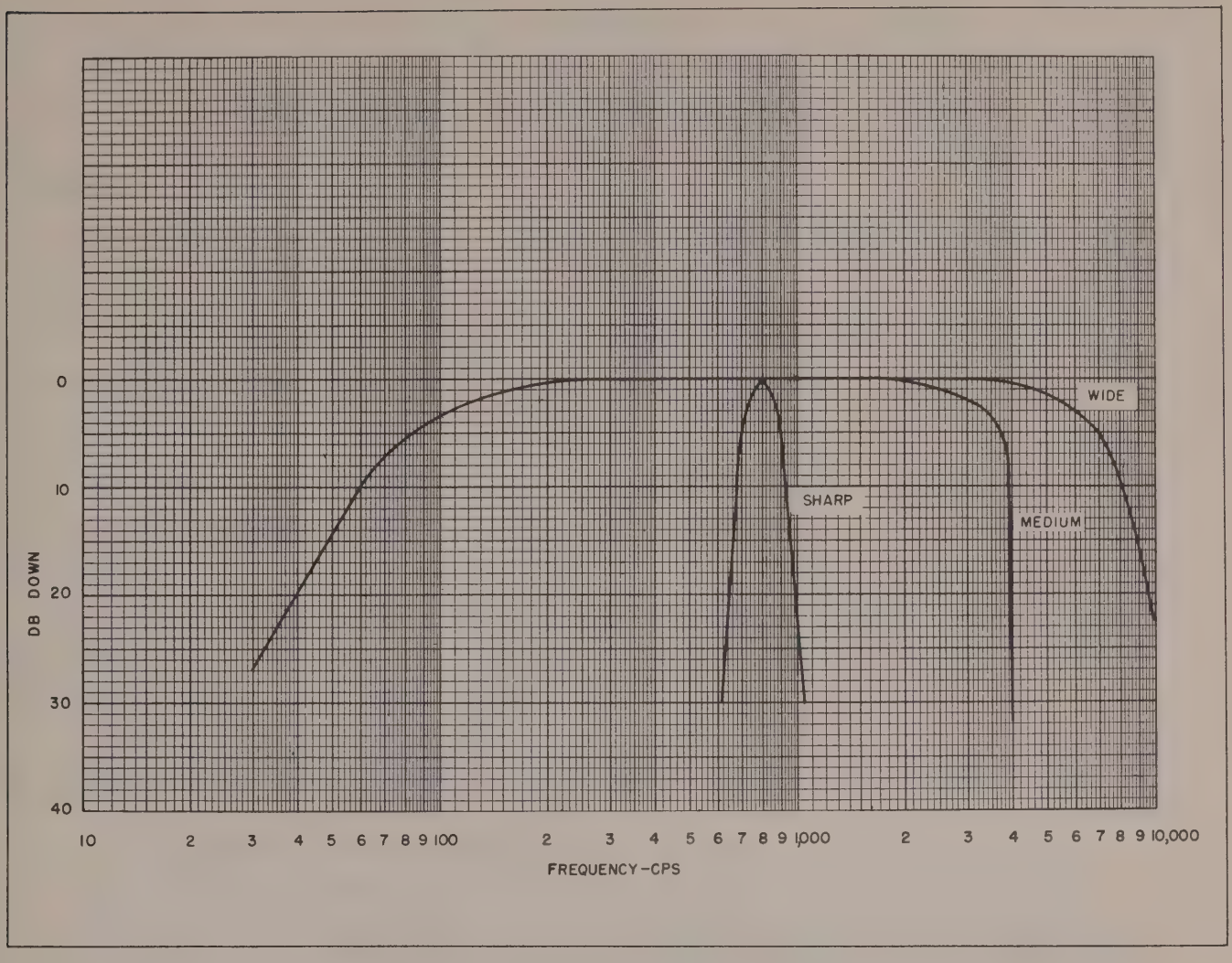

Figure 1-9. Overall Audio Response Chart

g. Remove test equipment as follows:

(1) Remove Signal Generator AN/URM-25D output lead and dummy antenna from the ANTENNA BALANCED 125 OHM jack on the receiver.

(2) Remove jumper between ANTENNA BALANCED 125 OHM jack and GND. Replace antenna.

(3) Remove lead from ground terminal on signal generator to GND terminal on the receiver. Disconnect signal generator power cord from 115 vac source.

(4) Remove output cable of Audio Oscillator TS-382 A/U from EXTERNAL MOD. terminals of the signal generator. Disconnect audio oscillator power cord from 115 vac source.

(5) Remove ground lead from audio oscillator ground to EXTERNAL MOD. terminal on signal generator.

(6) Remove Spectrum Analyzer TS-723/U leads from LOCAL AUDIO terminals 6 and 7 and remove 600 ohm, 1 watt resistor connected in parallel with spectrum analyzer leads.

h. Turn FUNCTION switch on the receiver to OFF, or STANDBY if the receiver is to be used shortly after this routine.

SECTION II

SERVICING ROUTINES

SERVICING ROUTINE - ALINEMENT OF 455 KC IF STAGES

1. GENERAL INFORMATION

a. The purpose of this routine is to properly aline Radio Receiver R-389/URR IF stages.

b. The approximate time required to do this routine is 3 hours.

c. The receiver and signal generator will be warmed up for 1 hour before any readings are taken.

d. Report to maintenance supervisor if receiver fails to aline properly.

2. TEST EQUIPMENT REQUIRED

a. Signal Generator AN/URM-25D

b. Electronic Multimeter TS-505/U.

3. MATERIALS REQUIRED

a. A 12 inch piece of No. 14 insulated copper wire. (Insulation should cover all of wire, except for 1 inch at each end.)

b. Bakelite tuning tool (for tuning Z501 only).

c. Screwdriver (for tuning all others).

4. PROCEDURE

a. Set up test equipment as follows (see Figures 2-1 and 2-2):

(1) Remove antenna, and top dust cover.

(2) Remove V205 and connect signal generator AN/URM-25D output lead to 12 inch piece of insulated copper wire. Wrap other end of wire around pin 1 of vacuum tube V205. Replace V205. See Figure 2-1 for explanation of tube pin numbers.

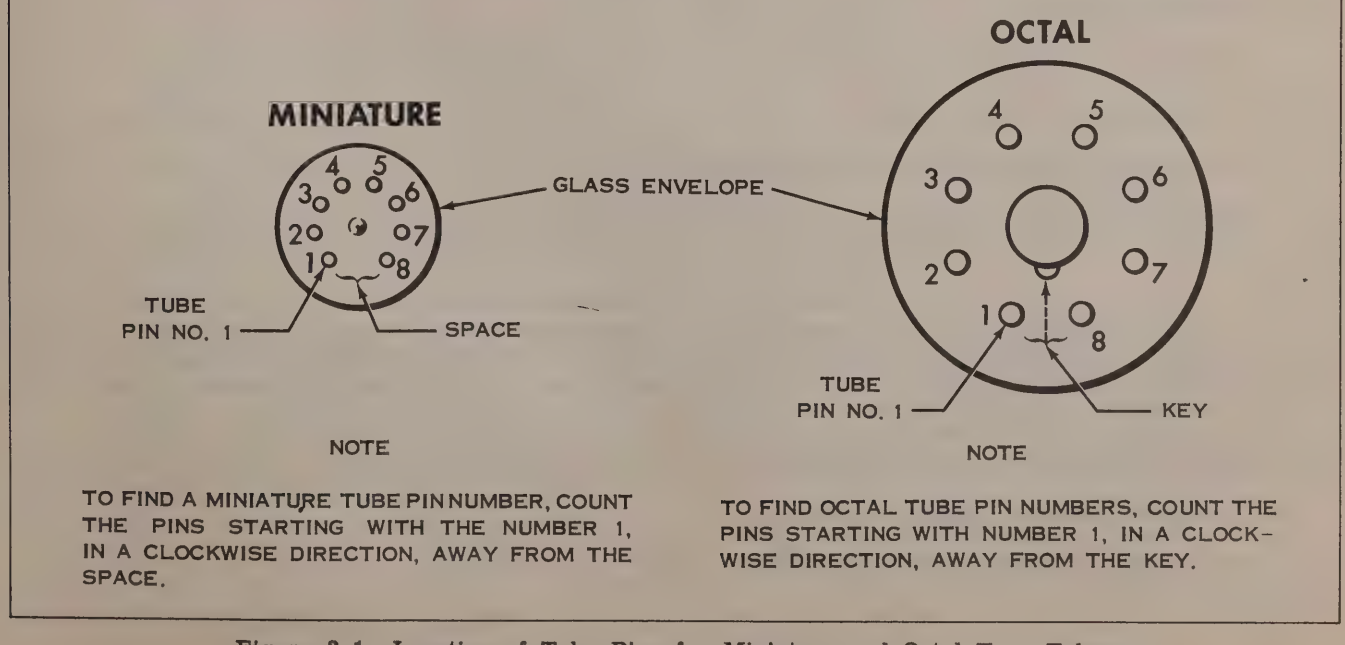

Figure 2-1. Location of Tube Pins for Miniature and Octal Type Tubes

(3) Connect ground lead of signal generator to GND terminal on rear panel of the receiver.

(4) Plug the signal generator power cord into a 115 vac source. Turn the signal generator on and allow to warm up.

(5) Connect ground lead of Electronic Multimeter TS-505/U to the terminal marked GND on the rear panel of the receiver.

(6) Connect the other lead of multimeter to terminal 15 (DIODE LOAD) on the rear panel of the receiver. Plug the multimeter power cord into a 115 vac source.

(7) Set function switch of multimeter for measuring negative (-) dc voltage.

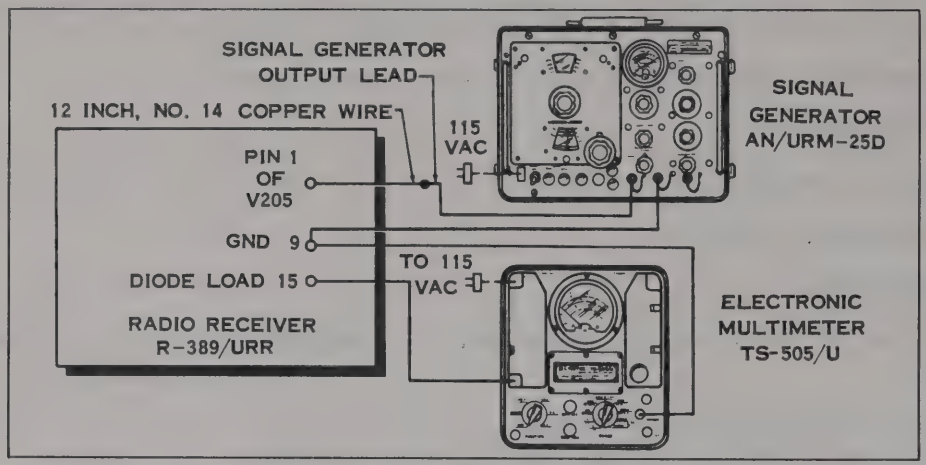

Figure 2-2. Test Equipment Setup

b. Set receiver controls as follows:

(1) IF BANDWIDTH switch to .1 KC.

(2) RF GAIN control to 10.

(3) BFO switch to OFF.

(4) FUNCTION switch to MGC.

(5) Remove antenna.

c. Pre-alinement procedures.

(1) Remove vacuum tube V210.

(2) Tune signal generator to 455 kc, unmodulated.

(3) Adjust signal generator frequency control for maximum indication on multimeter.

NOTE

It may be necessary to set the attenuator of the signal generator for high amplitude output (3 volts). If an indication on the multimeter is obtained, proceed with step "e", below. If indication is not obtained perform procedures given in step "d", to obtain approximate alinement before proceeding with step "e".

d. Obtain approximate alinement as follows:

(1) Set IF BANDWIDTH switch to 8 KC.

(2) If indication is obtained on multimeter:

(a) Adjust transformers listed below, in the order shown, for maximum indication on the multimeter.

T506	T504	T501
T505	T503	T218
	T502	

(b) Set IF BANDWIDTH to 1 KC.

(c) Adjust transformers as in step (a) above for maximum indication.

(d) Repeat step (a) above for 2 KC setting of IF BANDWIDTH switch until maximum indication is reached on the multimeter. It may be necessary to decrease the output of the signal generator if the multimeter indication gets too high.

(e) Set IF BANDWIDTH switch to .1 KC, and proceed with step 4.e below.

(3) If indication is NOT obtained on multimeter, the transformer cores have been greatly displaced from their normal positions within the coils. Adjust as follows for multimeter indication:

(a) Remove signal generator lead from V205. Turn output attenuator up for minimum signal generator output.

(b) Remove vacuum tube V506. Wrap No. 14 wire around pin 1. Replace tube, and connect other end of lead to signal generator output lead.

(c) Place IF BANDWIDTH switch in 2 KC position. Turn signal generator output to the point required to give a slight indication on the multimeter.

(d) Adjust transformer T506 for maximum indication on multimeter.

(e) Apply signal generator output to V505 in same manner as step (b) above.

(f) Adjust transformer T505 for peak indication on multimeter.

(g) Repeat process of injecting signal on tube (as in step (b) above) and adjusting transformer for each remaining set of IF tubes and transformers listed below:

V504 and T504
V503 and T503
V502 and T502
V501 and T501
V205 and T218

(h) Set IF BANDWIDTH switch to .1 KC, and proceed with step 4.e below.

e. Alinement of IF stages is accomplished as follows:

(1) Connect the signal generator output lead to pin 1 of V205 as in step 4.a (2).

(2) Carefully tune signal generator to exact frequency which gives maximum output as indicated on the multimeter.

(3) Adjust attenuator so that output shows 6 volts on the multimeter.

(4) Set IF BANDWIDTH switch to 2 KC.

(5) Adjust transformers listed below in order indicated for maximum indication on multimeter. After adjusting each transformer, adjust signal generator attenuator for a 6 volt indication on the multimeter. Readjust transformer and attenuator until no further increase is noted when the transformers are adjusted.

T506	T504	T502
T505	T503	T218

(6) Set IF BANDWIDTH switch to 8 KC.

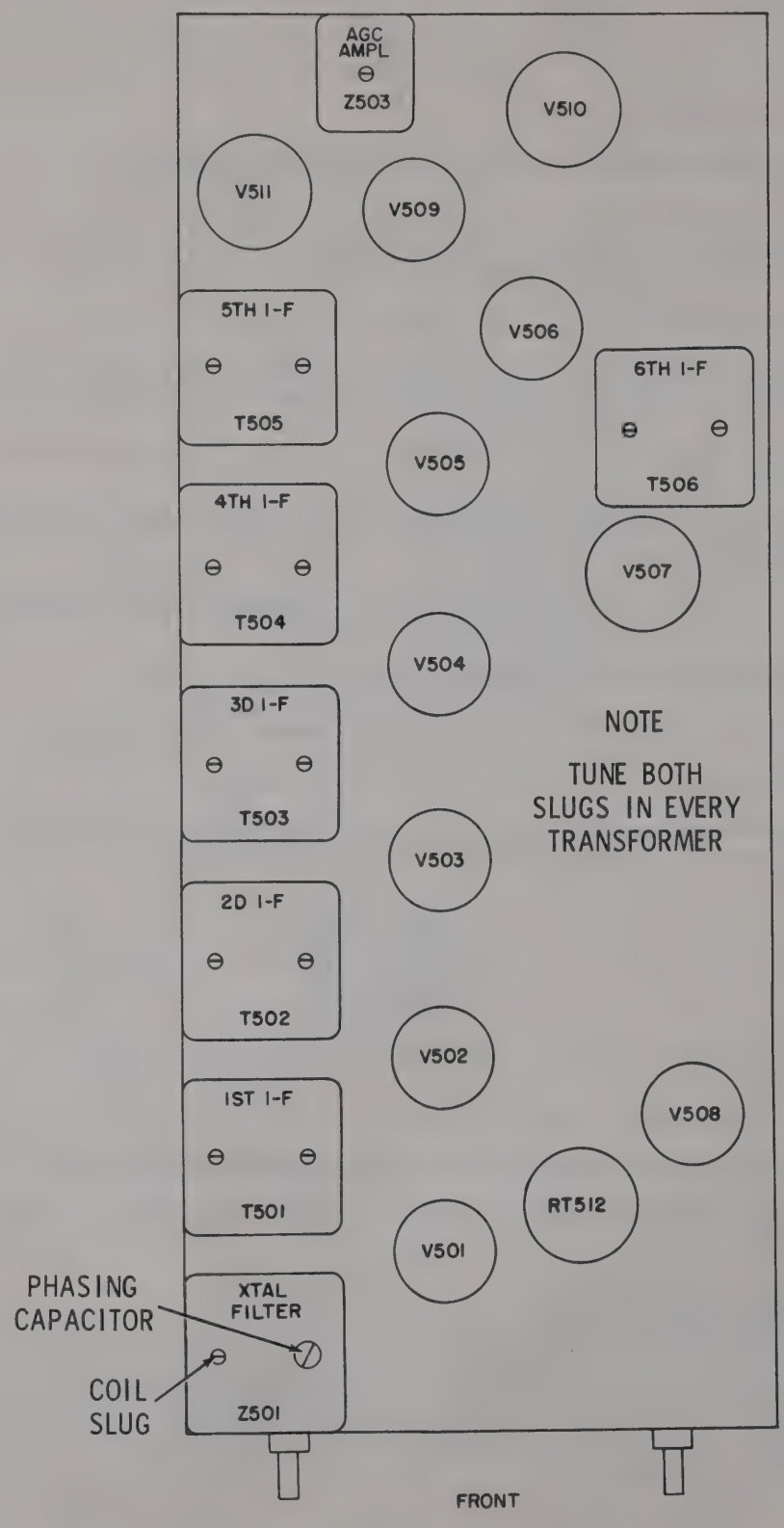

Figure 2-3. IF Subchassis

(7) Adjust T501 for maximum output. Adjust signal generator for 6 volts output on multimeter, then adjust T501 again for maximum output. Continue this until no further increase is noted when adjusting the transformer.

(8) Return IF BANDWIDTH switch to .1 KC position.

(9) Set the attenuator of the signal generator for an indication of approximately 6 volts on the multimeter and note attenuator setting.

(10) Set the signal generator attenuator at a point where the signal generator output will be 1000 times greater. The multimeter will "pin" or show a maximum indication.

(11) Tune the signal generator frequency output away from the 455 kc mark, in either direction. Stop tuning at the exact spot where the output indication on the multimeter again reads 6 volts.

(12) With the bakelite tuning tool, adjust the phasing capacitor in crystal filter Z501 for minimum voltmeter indication, and note the position of the capacitor slot.

(13) Retune the signal generator to 455 kc, then continue tuning the signal generator in the direction opposite that of step (11) above. Tune for a 6 volt indication on the multimeter.

(14) Again adjust the phasing capacitor in Z501 for minimum indication on the multimeter, and note the position of the capacitor slot.

(15) Set the capacitor approximately halfway between the two noted settings.

NOTE

To avoid possible incorrect indications caused by tuning through the positions of minimum or maximum capacitance, the two settings for minimum output must be less than 45° apart.

(16) Check to see if IF BANDWIDTH switch is in .1 KC position.

(17) Tune signal generator to obtain peak output on the multimeter.

(18) Set IF BANDWIDTH switch to 1 KC position.

(19) Adjust core of tuning coil in crystal filter Z501, until frequency indication for highest indication on multimeter is same as frequency indication for .1 KC position of IF BANDWIDTH switch.

(20) Repeat steps (17) and (19) for each position of IF BANDWIDTH switch.

(21) Set the IF BANDWIDTH switch to the .1 KC position.

(22) Tune the signal generator for maximum output as described in steps 4.e (1) through 4.e (3).

NOTE

Do not disturb this frequency setting the adjustment of the agc tuning circuit in the following steps.

(23) Disconnect the multimeter lead from terminal 15 of the terminal strip on the rear panel of the receiver, and connect it to terminal 4 on the rear panel.

(24) Set the FUNCTION switch to AGC.

(25) Set the IF BANDWIDTH switch to the 2 KC position.

(26) Insert vacuum tube V210 into its socket.

(27) Adjust signal generator attenuator for a 2 volt indication on the multimeter.

(28) Adjust core of Z503 for maximum voltage indication while simultaneously adjusting signal generator attenuation to maintain the 2 volt reference level on the voltmeter.

f. Disconnect test equipment as follows:

(1) Remove Electronic Multimeter TS-505/U leads from GND and terminal 4 on the rear panel of the receiver. Disconnect multimeter power cord from 115 vac power source.

(2) Remove Signal Generator AN/URM-25D lead and 12 inch wire from pin 1 of the vacuum tube, V205. Remove signal generator ground lead from GND on the rear panel. Disconnect signal generator power cord from 115 vac source.

(3) Replace antenna.

(4) Turn FUNCTION switch to OFF, or STANDBY if the equipment is to be used following this routine.

g. Replace top dust cover.

SERVICING ROUTINE - ALINEMENT OF RF STAGES

1. GENERAL INFORMATION

a. The purpose of this routine is to aline the RF sections of Radio Receiver R-389/URR.

b. The approximate time required to do this routine is 3 hours.

c. The receiver will be warmed up for 1 hour before proceeding with this routine.

d. Report to maintenance supervisor if receiver will not aline properly.

2. TEST EQUIPMENT REQUIRED

a. Signal Generator AN/URM-25D.

b. Electronic Multimeter TS-505/U.

c. Electronic Multimeter ME-6A/U, with low-capacity diode probe capable of measuring voltage at 10 mc.

3. MATERIAL REQUIRED

a. Bakelite tuning tool (used only for adjustment of T216 and T217).

b. Screwdriver (used for all other adjustments).

c. 125 ohm, 1 watt resistor (for dummy antenna).

d. 0.01 uf capacitor (for dummy antenna).

4. PROCEDURE

a. Remove all dust covers, and connect lead of Electronic Multimeter ME-6A/U (with low-capacity diode probe capable of measuring 10 mc) to J237. (See Figure 2-5.) Connect other lead to GND on the rear panel. Plug the multimeter power cord into a 115 vac source.

b. See Table V for complete procedure used to aline vfo and Injection Mixer circuits on the RF sub-chassis. Set the RF GAIN control at zero, and the FUNCTION switch to MGC for the complete procedure. Make all adjustments for a peak indication on the multimeter.

NOTE

In the event that the vfo and Injection Mixer circuits are difficult to aline, proceed with step 4.g, and then return to this step.

TABLE V

VFO AND INJECTION MIXER CIRCUIT ALINEMENT
(See Figures 2-4 and 2-5.)

Step Number	FREQ RANGE Switch	Frequency-Indicator Setting	Coil To Be Adjusted	Remarks
1	low (15-500 KC)	15	L274	
2	low	500	L275	
3	low	500		Repeat steps 1 and 2 until no noticeable increase in meter reading is obtained.
4	high (500-1500 KC)	500	L272	

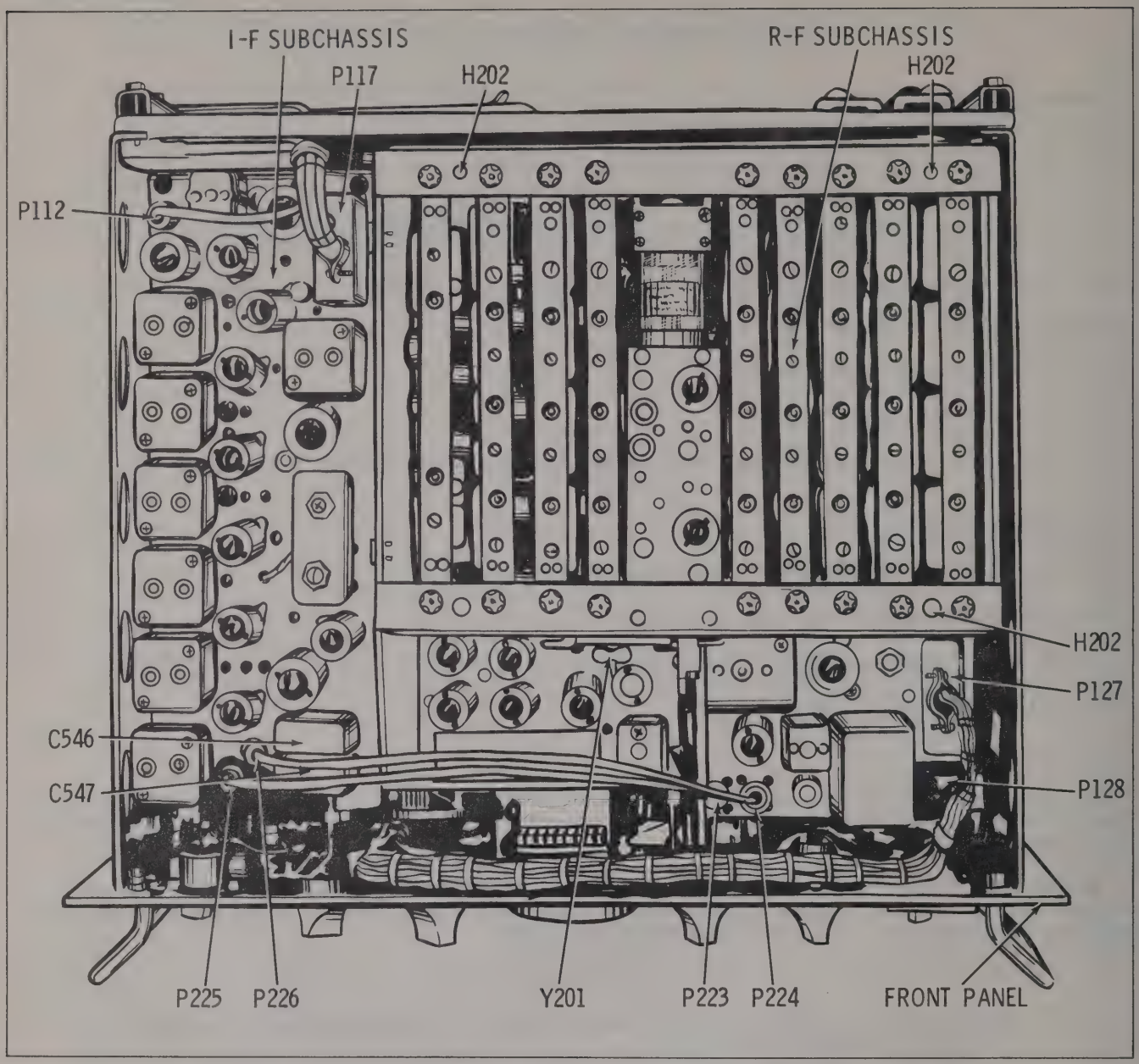

Figure 2-4. Radio Receiver R-389/URR, Top View, Dust Covers Removed

TABLE V (CONT)

Step Number	FREQ RANGE Switch	Frequency-Indicator Setting	Coil To Be Adjusted	Remarks
5	high	1500	L273	
6	high	1500		Repeat steps 4 and 5 until no noticeable increase in meter reading is obtained.
7	low	15		Note meter reading before making any adjustments.
8	low	15	L301	

TABLE V (CONT)

Step Number	FREQ RANGE Switch	Frequency-Indicator Setting	Coil To Be Adjusted	Remarks
9	low	15	L301	Back off L301 to a reading on the meter that is halfway between the value of steps 7 and 8.
10	low	15	L300	
11	low	500		Note the meter reading before making further adjustments.
12	low	500	L301	Note the number of turns and direction of trimmer rotation.
13	low	500	L301	Back off L301 one-half the number of turns and in the opposite direction to that noted in step 12.
14	low	500	L300	
15	low	500		Repeat steps 7 through 14 until no further meter reading increase is observed.
16	high	500		Note the reading of the meter before making any adjustments.
17	high	500	L303	
18	high	500	L303	Back off L303 to a meter reading that is halfway between the values of steps 16 and 17.
19	high	500	L302	
20	high	1500		Note the reading of the meter before making any adjustments.
21	high	1500	L303	Note the number of turns and direction of rotation.
22	high	1500	L303	Back off L303 one-half the number of turns in the opposite direction to that noted in step 21.
23	high	1500	L302	
24	high	1500		Repeat operations performed in steps 16 through 23 until no further increase in meter reading is noted.
25	low	15		Note the reading on the meter before making any adjustments.
26	low	15	L277	
27	low	15	L277	Back off L277 to a meter reading which is halfway between the values in steps 25 and 26.
28	low	15	L276	

TABLE V (CONT)

Step Number	FREQ RANGE Switch	Frequency-Indicator Setting	Coil To Be Adjusted	Remarks
29	low	500		Note the reading of the meter before making any adjustments.
30	low	500	L277	Note number of turns and direction of trimmer rotation.
31	low	500	L277	Back off L277 one-half the number of turns in the opposite direction to that noted in step 30.
32	low	500	L276	
33	low	500		Repeat operations performed in steps 25 through 32 until no further increase in meter reading is noted.
34	high	500		Note the meter reading before making any adjustments.
35	high	500	L279	
36	high	500	L279	Back off L279 to a meter reading which is halfway between the values of steps 34 and 35.
37	high	500	L278	
38	high	1500		Note reading of the meter before making any adjustments.
39	high	1500	L279	Note the number of turns and direction of rotation of trimmer rotation.
40	high	1500	L279	Back off trimmer L279 one-half the number of turns and in the opposite direction to that noted in step 39.
41	high	1500	L278	
42	high	1500		Repeat operations performed in steps 34 through 41 until no further increase in meter reading is noted.

c. Remove Electronic Multimeter ME-6A/U leads from J237 on the RF subchassis and GND on the rear panel terminal board. Disconnect the multimeter power cord from the 115 vac source.

d. Set up test equipment as follows:

(1) Remove antenna from rear panel. Connect Signal Generator AN/URM-25D output in series with dummy antenna (125 ohm resistor) to the ANTENNA BALANCED 125 OHM jack on the receiver.

(2) Place a jumper between remaining pin of the ANTENNA BALANCED 125 OHM jack and GND on the rear panel of the receiver.

(3) Connect lead from ground terminal on signal generator to GND (terminal 9) on the rear panel of the receiver. Plug signal generator power cord into 115 vac source.

(4) Set Electronic Multimeter TS-505/U for negative dc voltage and connect one lead to DIODE LOAD terminal 15 and the other lead to GND on the rear panel. Plug the meter power cord into a 115 vac source.

e. Aline first mixer output transformer (T216) as follows (see Figure 2-5):

(1) Set the FUNCTION switch to MGC.

(2) Set RF GAIN control to maximum.

(3) Set FREQ RANGE switch to 500-1500 KC.

(4) Set FREQ CHANGE switch to 1000 KC.

(5) Set BFO switch to OFF.

(6) Tune the signal generator for peak indication on the multimeter and adjust the output attenuator to keep the multimeter indication below 5 volts.

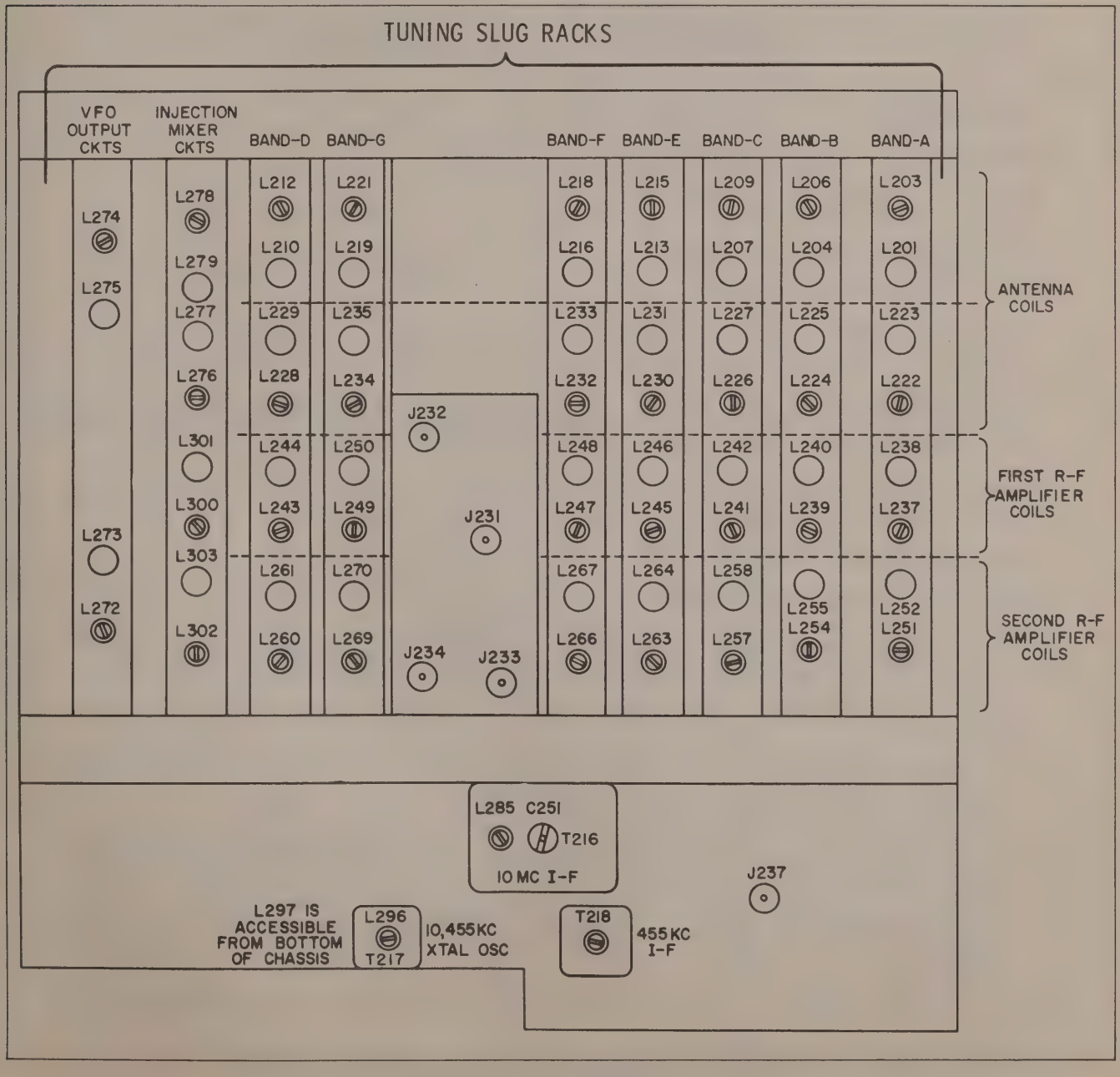

Figure 2-5. RF Subchassis

(7) Adjust L285 (secondary of T216) for a peak indication, on the multimeter, at the same time adjusting signal generator attenuation for a 5 volt indication on the multimeter. Continue adjustments until no further increase is obtained from adjusting L285.

(8) Follow procedure of preceeding step (7) above, but adjust trimmer capacitor C251 in place of L285 for a peak indication.

WARNING

There is high voltage on the trimmer capacitor (C251). Be sure to use the bakelite tuning tool for adjusting this capacitor.

f. To adjust Second Mixer Output Transformer (T218), repeat procedures of step "e", with receiver controls and test equipment set in same position, and adjust transformer T218 (instead of T216) to obtain a peak multimeter indication.

g. Aline 10,455 kc crystal oscillator as follows:

(1) Connect one lead of multimeter ME-6A/U to test jack J237 in order to measure the RF voltage. Connect other lead to main frame of receiver at any convenient point.

(2) Adjust the slug of primary coil L296 (part of T217, Figure 2-5) to obtain a peak indication on the multimeter.

(3) Adjust L297 for a peak indication on the multimeter.

(4) Disconnect multimeter from J237.

(5) Set the FUNCTION switch to MGC.

(6) Set the RF GAIN control to 10.

(7) Set FREQ RANGE switch to 500-1500 KC.

(8) Tune the receiver for a dial reading of 1500 kc.

(9) Tune the signal generator for peak indication on the multimeter and adjust the output attenuator of the signal generator to keep the multimeter indication below 5 volts.

(10) Remove the clamping bar from the bottom of the chassis (Figure 1-5) to gain access to the slug of secondary coil L297.

h. RF stages are alined as follows:

(1) Leave multimeter TS-505/U connected as it was in step 4.g.

(2) If preliminary adjustments are not necessary (as shown in step (3) below) leave the signal generator connected as it is from step 4.d and proceed to step (4) below.

(3) If preliminary adjustments are necessary because of extreme misalinement use the following procedures:

(a) Disconnect signal generator, and connect 0.01 uf capacitor, 10,000 ohm resistor and output of signal generator in series as shown in Figure 2-6.

(b) See Table VI column 5, for connection points of signal generator output during preliminary alinement. To make connection, merely place the wire lead of the 10,000 ohm resistor in the plug or jack called for. Bend the lead to insure making a good connection.

(c) Reconnect the signal generator to the antenna input terminals as instructed in step 4.d and proceed to following steps.

(4) With the FREQ CHANGE control, set the frequency-indicator dial to the readings listed in the first column of Table VI.

(5) Set the FREQ RANGE switch to the position indicated in the second column.

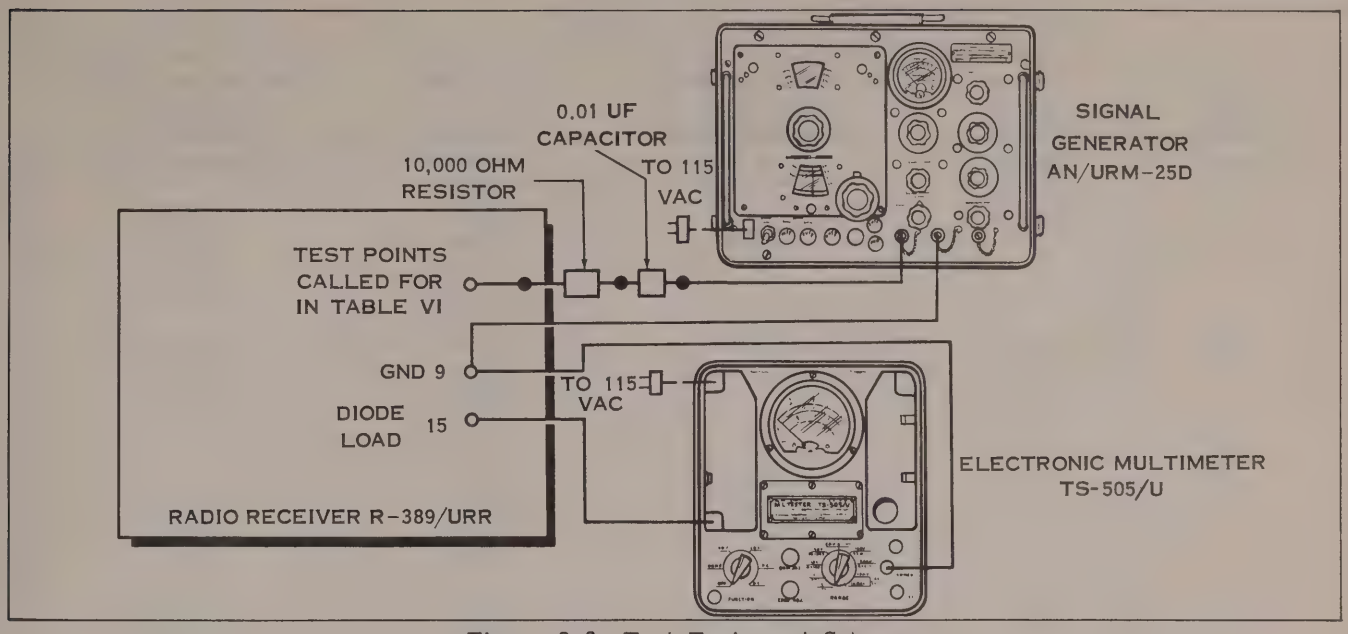

Figure 2-6. Test Equipment Setup

(6) Set the signal generator to the frequency listed in the third column.

NOTE

To obtain the exact required frequency, tune the signal generator for a peak indication on the multimeter.

(7) During the alinement procedure, change the setting of the signal generator attenuator as required to maintain an output indication of less than 5 volts on the multimeter.

(8) Proceed with the RF alinement by performing the adjustments in the order listed in Table VI. Refer to Figure 2-5 for location of tuning slugs.

TABLE VI

RF ALINEMENT
(See Figures 2-4 and 2-5.)

FREQ CHANGE Control Setting	FREQ RANGE Switch Position	Signal Generator Frequency (Tune For Peak Output) In Kc	Adjust Slugs For Peak Output	Signal Generator Connection (Preliminary Alinement Only)
15	15-500	15	L251 L237 L222 L203	J234 J232 J231 P209
26	15-500	26	L252 L238 L223 L201	J234 J232 J231 P209
28	15-500	28	L254 L239 L224 L206	J234 J232 J231 P209
54	15-500	54	L255 L240 L225 L204	J234 J232 J231 P209

TABLE VI (CONT)

FREQ CHANGE Control Setting	FREQ RANGE Switch Position	Signal Generator Frequency (Tune For Peak Output) In Kc	Adjust Slugs For Peak Output	Signal Generator Connection (Preliminary Alinement Only)
56	15-500	56	L257 L241 L226 L209	J234 J232 J231 P209
115	15-500	115	L258 L242 L227 L207	J234 J232 J231 P209
120	15-500	120	L260 L248 L228 L212	J234 J232 J231 P209
240	15-500	240	L261 L244 L229 L210	J234 J232 J231 P209
245	15-500	245	L263 L245 L230 L215	J234 J232 J231 P209
500	15-500	500	L264 L246 L231 L213	J234 J232 J231 P209
500	500-1500	500	L266 L247 L232 L218	J234 J232 J231 P209
860	500-1500	860	L267 L248 L233 L216	J234 J232 J231 P209
870	500-1500	870	L269 L249 L234 L221	J234 J232 J231 P209
1500	500-1500	1500	L270 L250 L235 L219	J234 J232 J231 P209

i. Disconnect test equipment as follows:

(1) Remove Signal Generator AN/URM-25D output lead and dummy antenna from the ANTENNA BALANCED 125 OHM jack.

(2) Remove jumper between signal generator ground terminal and GND (terminal 9) on the receiver rear panel. Disconnect signal generator power cord from 115 vac source.

(3) Remove leads of Multimeter TS-505/U from DIODE LOAD terminal 15, and GND on the rear panel. Disconnect multimeter power cord from 115 vac source.

j. Replace antenna.

k. Replace dust covers.

l. Place FUNCTION switch in OFF position, or if equipment is to be used after this routine place switch in STANDBY position.

SERVICING ROUTINE - ADJUSTMENT OF BANDSWITCHING MOTOR CONTROL SWITCH, FREQ CHANGE SLIP CLUTCH, DISC CLUTCH ASSEMBLY, AND REGULATED VOLTAGE HUM

1. GENERAL INFORMATION

   a. The purpose of this routine is to accomplish adjustments on Radio Receiver R-389/URR.

   b. The approximate time required to do this routine is 90 minutes.

   c. The receiver will be warmed up for 15 minutes before starting this routine.

   d. Report to maintenance supervisor any malfunction observed in the receiver during this routine.

2. TEST EQUIPMENT REQUIRED

   a. Multimeter TS-352/U.

   b. Electronic Multimeter ME-6A/U.

   c. Transformer CN-16/U (Variable Autotransformer).

3. MATERIALS REQUIRED

   a. Narrow bit screwdriver.

4. PROCEDURE

   a. Remove top dust cover and shield from receiver, then remove bottom dust cover.

   b. Adjust bandswitching motor control switch as follows:

      (1) Turn FREQ CHANGE control to tune the receiver to 27 kc.

      (2) Loosen the clamp screw of the slider associated with switch S205A.

      (3) Adjust slider so it rests between the segments of bands A and B. Tighten the clamp screw.

      (4) Check to see that bandswitching takes place between 26 and 28 kc for rotation in either direction of FREQ CHANGE knob.

      NOTE

      Bandswitching occurs when the tuning slug rack (for band A) reaches the top of its travel and the next band (band B) tuning slug rack starts moving up from the bottom position of its travel.

      (5) Tune the receiver to 865 kc by turning the FREQ CHANGE knob.

      (6) Loosen the clamp screw associated with switch S205B.

      (7) Adjust the slider so that it rests between the segments of bands F and G. Tighten the clamp screw.

      (8) Check to see that the bandswitching takes place between 860 and 870 kc for rotation in either direction of the FREQ CHANGE knob. (See note above, and Table II to determine in which band frequency lies.)

      (9) Make sure that open-circuit conditions exist between the sliders and associated band segments as follows:

         (a) Turn the function switch on Electronic Multimeter ME-6A/U to its lowest ohms scale.

         (b) Touch the tip of one lead to the slider.

         (c) Touch the tip of the other lead on each of the band segments in turn. There should be no indication on the multimeter at any point.

c. Adjust FREQ CHANGE slip clutch as follows:

(1) Place FUNCTION switch in MGC.

(2) Operate the tuning motor by turning MOTOR TUNE knob on front panel. Allow it to operate until the 52-turn stop engages at either the high or low extremity of the tuning system (15 kc or 1500 kc).

WARNING

Be careful to keep fingers and tools away from moving parts while the MOTOR TUNE switch is operated.

(3) Tighten the slip-clutch screws until the FREQ CHANGE knob turns the frequency-indicator counter. The slip clutch is located in the FREQ CHANGE knob housing. (See Figure 2-7.)

(4) Proper adjustment occurs when the knob slips as the DIAL LOCK is tightened, and normal manual tuning is possible when the DIAL LOCK is disengaged.

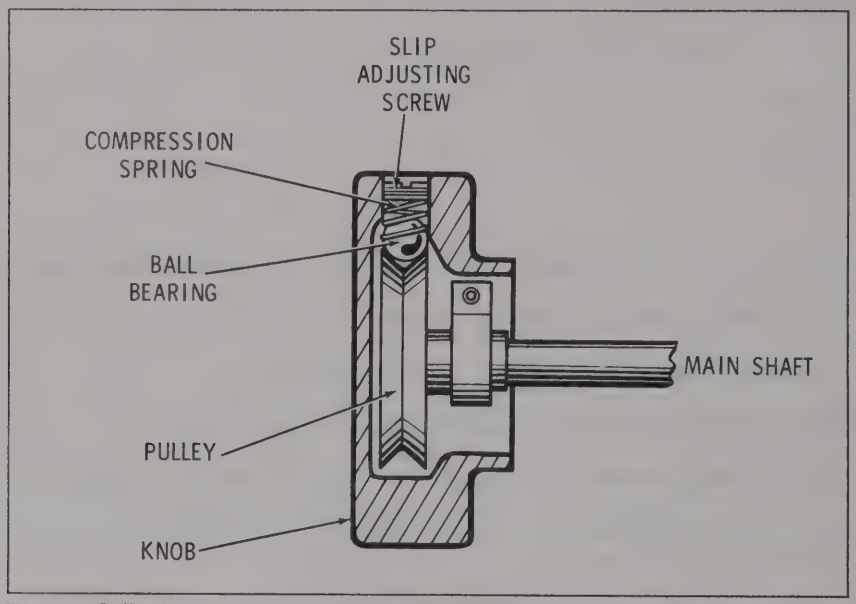

Figure 2-7. FREQ CHANGE Knob Slip Clutch, Cross Sectional View

d. Adjust the Disk Clutch Assembly as follows:

(1) Loosen the clutch-adjusting nuts (Figure 2-8). These are accessible from the bottom of the receiver.

(2) Move the clutch arm mounting post to the position that permits the gear train to turn when the MOTOR TUNE switch is operated.

(3) Correct positioning of the clutch arm mounting post occurs when the clutch slips easily as the receiver is manually tuned, yet engages the gear train when the MOTOR TUNE switch is operated.

WARNING

Be careful to keep fingers and tools away from moving parts while the MOTOR TUNE switch is operated.

e. Adjust Regulated Voltage Hum Adjustment as follows:

(1) Connect female end of power cable assembly CX-1358/U (supplied with the equipment) to the POWER receptacle (J102) on the rear panel of the receiver.

(2) Connect male end of power cable to Transformer CN-16/U.

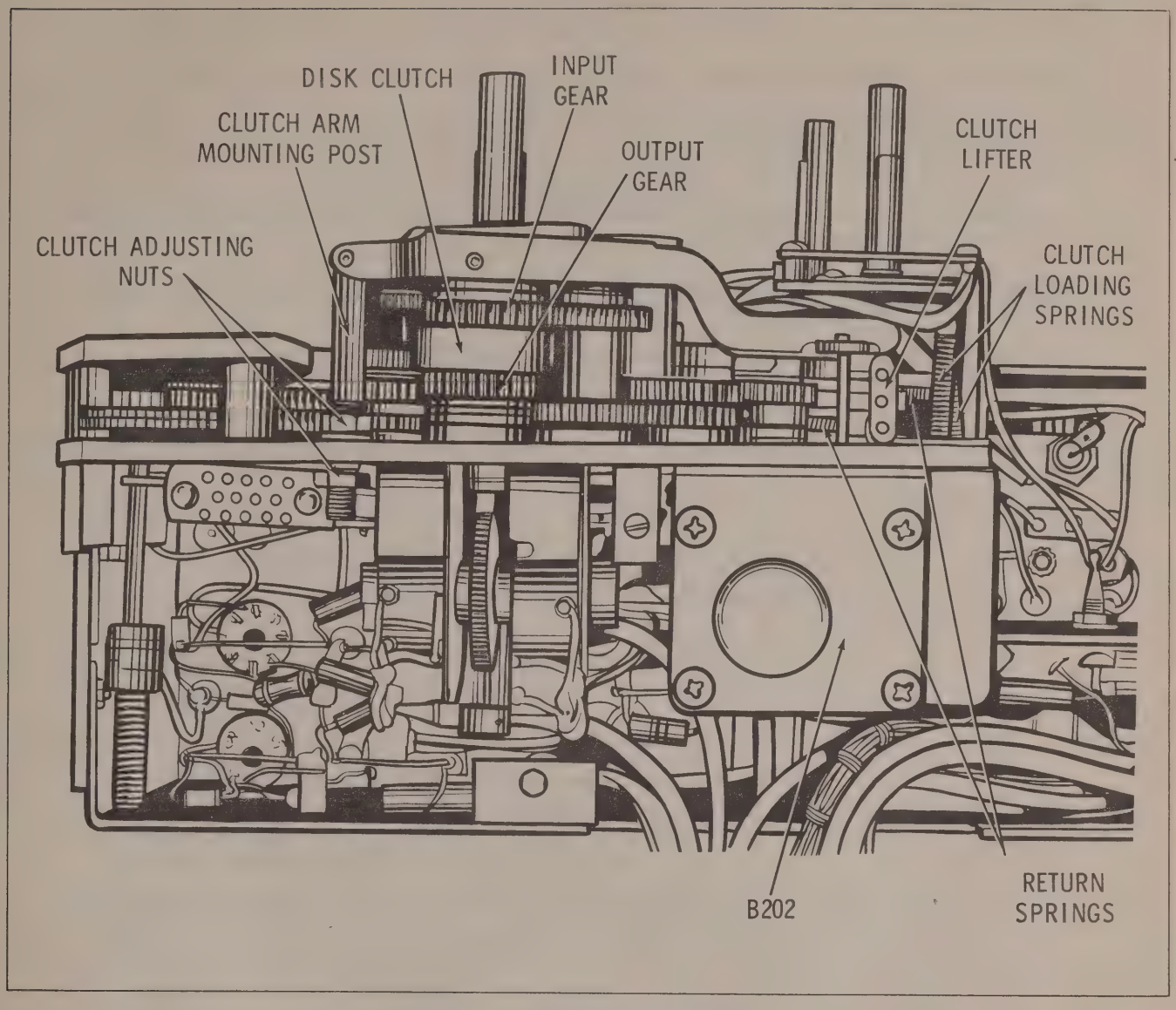

Figure 2-8. Disk Clutch Assembly

(3) Connect Multimeter TS-352/U leads across output of transformer and set the meter FUNCTION switch to the ac range. Place one lead in the 250V jack on the multimeter, and the other to CASE GROUND on the meter.

(4) Connect ground lead of Electronic Multimeter ME-6A/U to GND on the terminal board at the rear panel. Plug multimeter power cord into a 115 vac source.

(5) Connect other lead of ME-6A/U to one lead of a 0.01 uf capacitor and place other capacitor lead in the B+ 180 VDC jack (J601). Place meter in 0.01 to 0.1 volt ac range. (See Figure 1-2.)

(6) Connect a meter lead from GND on the rear panel to the frame of the transformer. Be sure the receiver frame is grounded to a metal pipe or other fixed metal object.

(7) Place switch S801 on the Power Supply (PP-621/URR) in the 115 volt position.

(8) Turn FUNCTION switch to MGC.

(9) Plug in transformer power cord to a 115 vac source.

(10) Adjust transformer for an accurate 115 v line voltage indication on Multimeter TS-352/U.

(11) Adjust HUM BAL control R614 for minimum indication on Multimeter ME-6A/U.

NOTE

The HUM BAL control is accessible through the right side plate of the main frame.

f. Disconnect test equipment as follows:

(1) Remove Transformer CN-16/U power cord from the 115 vac source.

(2) Remove receiver power cable from Transformer CN-16/U and also remove meter lead connected to transformer frame and GND on the rear panel of the receiver.

(3) Remove leads of Electronic Multimeter ME-6A/U from J601 and GND on the receiver. Disconnect meter power cord from the 115 vac source.

(4) Remove Multimeter TS-352/U leads from output of transformer.

g. Replace shield on RF subchassis, and top cover.

h. Place function switch in OFF position, or if equipment is to be used after this routine, place switch in STANDBY position.

SERVICING ROUTINE - OPERATION

1. GENERAL INFORMATION

a. The purpose of this routine is to determine if Radio Receiver R-389/URR is in proper operating condition, after installation or overhaul.

b. The average time required to do this routine is 60 minutes.

c. The equipment will be warmed up for 15 minutes before starting this routine.

d. Report malfunctions, failures or incompleteness of installation to the supervisor for corrective action.

2. TEST EQUIPMENT REQUIRED

a. Signal Generator AN/URM-25D.

b. Electronic Multimeter TS-505/U.

3. MATERIALS REQUIRED

a. 600 ohm headset or 600 ohm speaker.

b. One 12 inch meter lead or other insulated wire suitable for use as a jumper.

c. Narrow bit screwdriver.

d. 125 ohm resistor (for dummy antenna).

4. PROCEDURE

a. Connect the 600 ohm headset or speaker as follows:

(1) Plug the headset into the PHONES jack on front panel, or connect headset between PHNS terminal 8 on back panel, and GND (terminal 9).

(2) Connect the speaker between LOCAL AUDIO terminals 6 and 7 on back panel.

b. Visually check the following for completion:

(1) Antenna lead in wire connected at back panel.

(2) Proper connection of speaker or headset per paragraph 4.a above.

(3) Terminals 11 and 14 connected to 600 ohm transmission line. (When receiver is being used for teletype reception.)

(4) Power cable connected to J102 at one end, and power source at the other end.

(5) Following pairs of terminals connected by jumper wire:

(a) 1 and 3

(b) 3 and 4

(c) 12 and 13

(d) 15 and 16

(6) External ground connected to terminal 9 or 10 as safety precaution.

c. Position switches as follows:

(1) AUDIO RESPONSE switch to MEDIUM.

(2) IF BANDWIDTH switch to 4 or 8 KC.

(3) RF GAIN control to 10.

(4) LOCAL GAIN control to 5.

(5) FREQ RANGE switch to 500-1500 KC.

(6) FREQ CHANGE control to approximately 1000 KC.

d. Turn power on by placing FUNCTION switch in STANDBY. Dial lights should light.

e. Turn FUNCTION switch to AGC. A rushing noise or signal should be heard in speaker or headset. RF bandswitching system may "cycle" depending on position of FREQ CHANGE and FREQ RANGE controls previous to turning the set on.

f. Position switches named below and observe results as follows:

(1) Turn MOTOR TUNE switch in either direction. FREQ CHANGE and counter wheels should rotate.

(2) Rotate FREQ CHANGE control. CARRIER LEVEL meter should show an indication whenever a signal is received.

(3) Rotate LOCAL GAIN control several times in either direction. The volume at the loudspeaker or headset should increase and decrease.

(4) With the receiver tuned in to a station, set LINE METER switch to 0. Then rotate LINE GAIN control. LINE LEVEL meter should increase or decrease as the LINE GAIN control is rotated.

(5) Rotate RF GAIN control. Audio output at headset or speaker, and CARRIER LEVEL meter (if signal is present) indication should increase or decrease.

(6) Position FUNCTION switch as follows and observe results:

(a) Turn to MGC. With no signal input, noise level should increase. No indication will be observed on CARRIER LEVEL meter if signal is absent.

(b) Turn to AGC. Rotate FREQ CHANGE control through several different signals. The output volume in headset or loudspeaker should remain relatively constant. Starting at the 8 KC position of the IF BANDWIDTH switch, set it in turn to each lower position. The noise-volume in the headset or speaker should decrease noticeably with each lower setting.

(c) Turn to SQUELCH. Rotate FREQ CHANGE control. There should be no reception of noise while tuning between stations.

(d) Return FUNCTION switch to AGC, and RF GAIN control to 10 after the above checks.

(7) Turn LIMITER control clockwise. Background noise should be reduced.

(8) Turn BREAK IN switch to ON. Short BRK IN terminal (5, on rear panel) to ground momentarily with the 12 inch meter lead. LINE LEVER meter indication drops to zero. Break-in relays should operate.

(9) To determine if LINE METER switch operates properly, proceed as follows:

(a) Remove antenna.

(b) Attach output of Signal Generator AN/URM-25D in series with 125 ohm resistor (dummy antenna) to ANTENNA BALANCED 125 OHM receptacle.

(c) Attach ground lead from the signal generator to GND (terminal 9) on the rear panel of the receiver. Plug signal generator power cord into 115 vac source.

(d) Turn the signal generator on. Tune it to 1000 kc; turn the 400 cycle modulation on, and adjust it for 30 percent modulation.

(e) Remove 600 ohm transmission line from terminals 11 and 14 on the rear panel of the receiver.

(f) Connect leads of Electronic Multimeter TS-505/U to terminals 11 and 14. Turn multimeter function switch to the negative (-) dc scale. Plug multimeter power cord into 115 vac source.

(g) Turn LINE METER switch to +10. The multimeter should have an indication which is 10 db above LINE LEVEL meter reading.

(h) Turn LINE METER switch to 0. The multimeter should have the same db reading as the LINE LEVEL meter.

(i) Turn LINE METER switch to -10. The multimeter should have a reading 10 db below that of LINE LEVEL meter.

(j) Turn LINE METER switch to OFF. LINE LEVEL meter should show no indication. Multimeter, however, will show an indication.

(k) Disconnect all test equipment, and replace antenna. Return 600 ohm transmission line to terminals 11 and 14.

(10) Turn the BFO OFF-ON switch to ON. Tune in a cw signal, and vary the BFO PITCH control. The tone of the signal should vary.

(11) Turn IF BANDWIDTH switch from 8 to .1 KC. Turn FREQ CHANGE control through several stations. Selectivity should become sharper with an appreciable reduction of noise, as IF BANDWIDTH switch approaches .1 KC position.

(12) Operate the AUDIO RESPONSE switch through its three positions. This control regulates the amount of the audio frequency range amplified. WIDE amplifies the whole audio range. MEDIUM covers the medium and low frequencies, and SHARP amplifies only signals in the vicinity of 800 cycles/sec.

(13) Turn FUNCTION switch to STANDBY. The receiver should be silent but all tubes will still be lit up. If the receiver is to be used within a few hours, allow the FUNCTION switch to remain in STANDBY. If not turn the switch to OFF, and the unit will be completely de-energized.

(14) To check oven for proper operation, remove top dust cover and touch the vfo subchassis and the oven to determine if they are hot. Replace top dust cover after this operation.

SECTION III

CLEANING, INSPECTION AND LUBRICATION ROUTINES

CLEANING, INSPECTION AND LUBRICATION ROUTINE - RADIO RECEIVER R-389/URR

1. GENERAL INFORMATION

a. This routine provides cleaning, inspection and lubrication instructions for Radio Receiver R-389/URR.

b. The approximate time required to complete this routine is 2 hours.

c. Report all defective items noted to the maintenance supervisor.

2. TEST EQUIPMENT REQUIRED

a. None.

3. MATERIALS REQUIRED

a. Clean, lint-free cloth.

b. Cleaning brush.

c. #0000 sandpaper.

d. Screwdriver.

e. Vacuum cleaner or compressed-air line (for cleaning inaccessible places).

f. Solvent, Dry Cleaning (SD), Federal Spec P-S-661.

g. Grease, Aircraft and Instruments (GL), MIL-G-3278.

h. Oil, General Purpose, Low Temperature, Lubricating (OGP) MIL-L-7870.

i. Grease, MIL-G-7421.

j. Clean, stiff copper wire, uninsulated.

4. PROCEDURE

a. Turn the FUNCTION switch on the front panel to OFF.

b. Disconnect the following:

(1) Power cord from POWER receptacle on the rear panel.

(2) Antenna from ANTENNA BALANCED 125 OHM or UNBALANCED receptacle, (whichever the case).

(3) Remote transmitter cable from REMOTE CONTROL receptacle on the rear panel.

(4) Cable from IF OUTPUT 50 OHM receptacle to Frequency Shift Converter.

(5) Balanced Transmission Line to Auxiliary Equipment from terminals 11 and 14 on the rear panel.

c. Remove receiver from rack or whatever mounting is used and place it on a workbench.

d. Remove top and bottom dust covers, and RF subchassis shield at the top of the equipment.

e. Clean and inspect as follows:

(1) Compare equipment with Figures 3-1 and 3-2 to check for completeness.

(2) Operate the controls to check for binding, scraping, excessive looseness, and positive action.

Rough action or binding of FREQ CHANGE control indicates a damaged tuning system or the need for cleaning and lubrication.

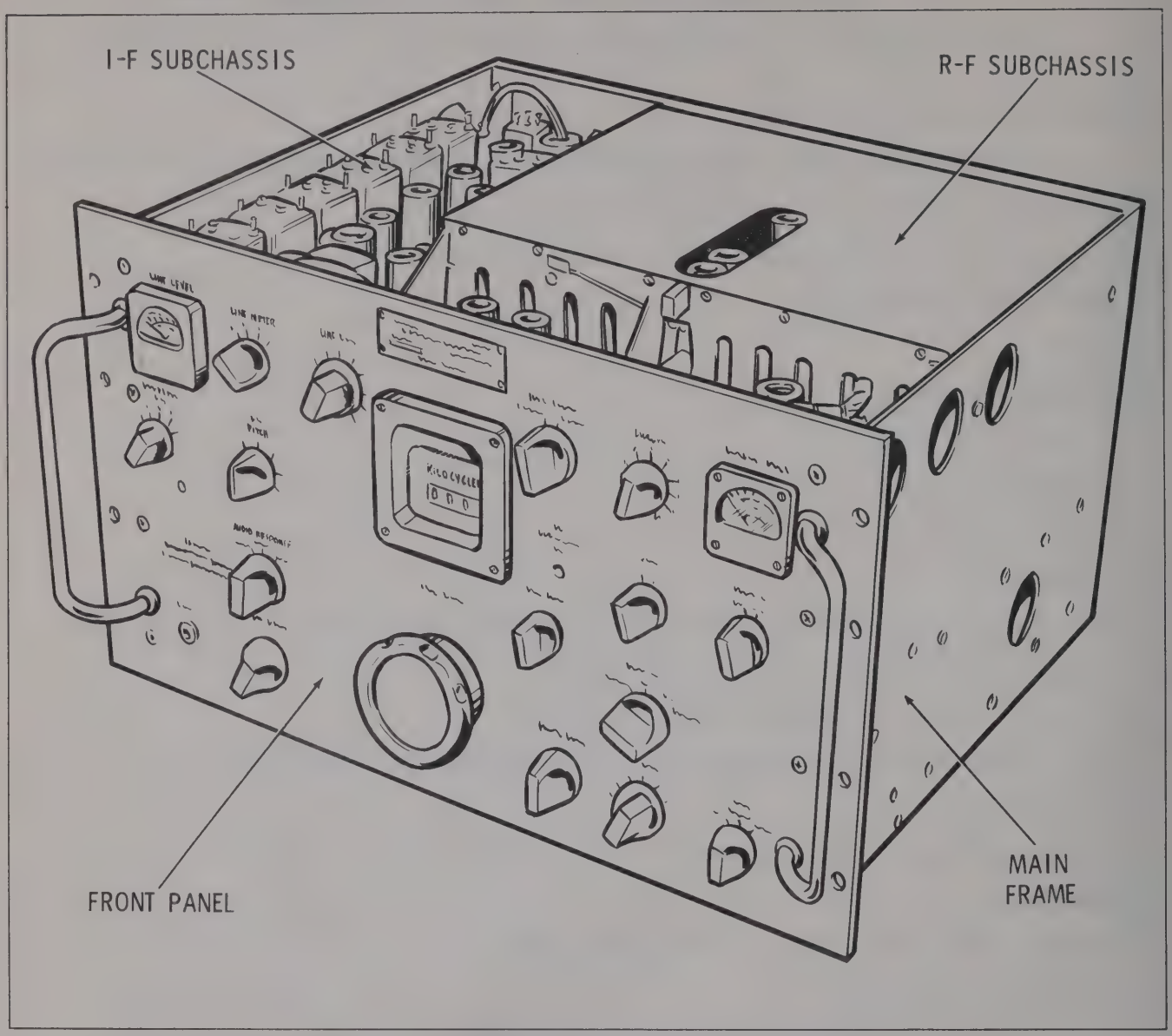

Figure 3-1. Radio Receiver R-389/URR, Top View

(3) Inspect the case, front and back panels, and whip antenna (if used) for moisture and corrosion. Remove rust spots on the antenna base with #0000 sandpaper.

NOTE

If a touch-up job is necessary on the receiver case or front panel, remove loose paint and rust from the case and front panel with sandpaper and apply paint with a small brush. Paint used will be No. 2610 semigloss gray enamel.

(4) Inspect the front panel meters and the frequency indicator for cracked or broken glass windows (see Figure 3-1).

(5) Use a clean, damp cloth to clean the glass windows of the front panel meters and frequency-indicator; and then wipe them dry. Clean the nameplate.

(6) Inspect the antenna lead-in cable, power cable, headset cord, (and all other external cables disconnected in step 4.b) for cuts, breaks, fraying, deterioration, kinks, and strain.

(7) Use a clean, lint-free cloth to remove dust, dirt, moisture, and grease from the whip antenna (if used) and base, headset, front and back panels, and dust covers.

(8) Clean and tighten the exterior of the case, POWER and REMOTE CONTROL connectors, and whip antenna base. Use a clean, lint-free cloth. Remove grease if necessary with a cloth dampened in solvent (Federal Spec P-S-661).

(9) Remove the tubes from their sockets, one at a time, and inspect for loose envelopes and cracked sockets. (See Figure 2-1.)

(10) Remove dust and dirt from the tube envelopes and from their sockets and the area around them.

(11) Straighten the tube pins in the pin straighteners on the back panel.

(12) Replace the tubes carefully. See that they are seated firmly in the socket in an upright position, and that the tube shields are replaced correctly.

(13) Inspect fixed capacitors C104 and C103 on the main frame (Figure 1-5) for signs of leakage, bulging and discoloration.

(14) Inspect capacitors C546 and C547 on the 455 kc IF subchassis (Figure 1-4) for signs of leakage, bulging and discoloration.

(15) Inspect the antenna relay (located just below the antenna box, Figure 3-2) for loose mounting; burned, pitted or corroded contacts; misalinement of contacts and springs; and insufficient spring tensions.

(16) Inspect all visible resistors for cracks, chipping, blistering, discoloration, and moisture.

(17) Inspect the terminals of large fixed capacitors and resistors for corrosion, dirt and loose contacts.

(18) Clean and tighten all connectors in the receiver (Figure 1-4 and 1-5).

(19) Inspect the terminal strips for loose connections, cracks, and breaks.

(20) On motor B202, inspect the brushes for wear, spring tension, arcing and correct fit on the commutator. (See Figure 1-5.) To remove the brushes, remove triangular shaped snap ring, and fiber washer beneath it. The brush holding spring will snap out when the washer is removed.

(21) Clean and tighten the connections and mountings for transformers, chokes, potentiometers, and rheostats. Use the vacuum cleaner or air pressure (not to exceed 60 psi) to clean the inaccessible places.

(22) Inspect transformer T801 of Power Supply PP-621/URR (Figure 3-2) for signs of over-heating and leakage.

f. Lubricate as follows:

(1) Clean before lubricating as follows:

(a) Remove the RF subchassis as instructed in Routine 1.3(4). Inspect the RF, and IF subchassis and the back of the front plate as instructed in step 4.e (16) through (19).

(b) Dip a thin long-handled brush (having medium bristles) in Solvent, Dry Cleaning (SD), Federal Spec P-S-661.

NOTE

After dipping the brush in solvent, remove the excess fluid to prevent it from dripping on connecting cables, wiring, or other electrical parts.

(c) Remove dirt, oil, and grease from the gears, bearings and lead screws with the solvent. Rotate the FREQ CHANGE control to gain access to all the gear teeth.

(d) Before proceeding with lubrication, dry all parts with dry compressed air of not over 60 psi

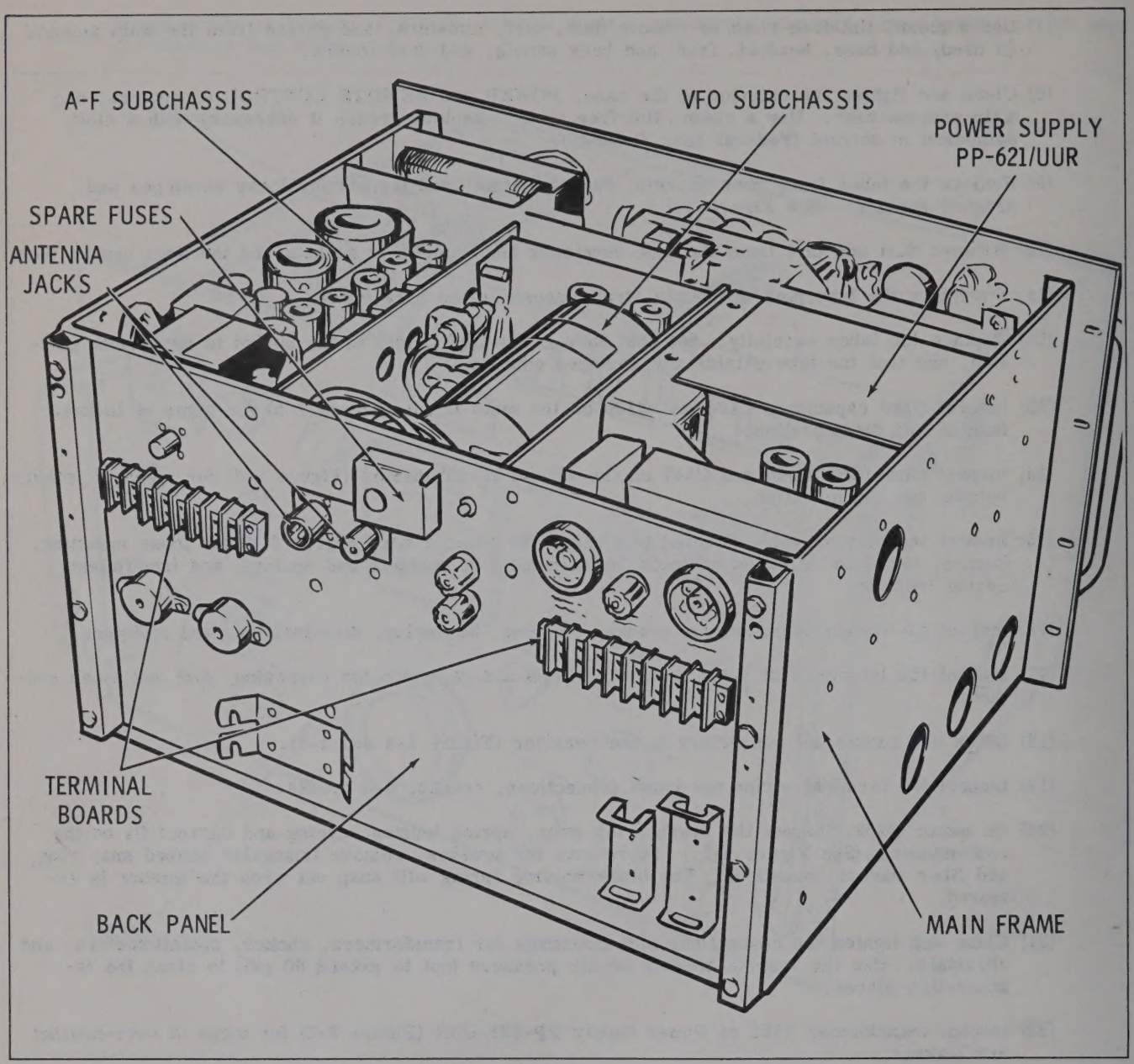

Figure 3-2. Radio Receiver R-389/URR, Bottom View

pressure. If compressed air is not available, use a clean, dry, lint-free cloth.

CAUTION

Never attempt to lubricate the sealed oscillator (vfo), regardless of possible noisy operation of the unit during tuning. Unstable operation of the receiver may result.

(2) Proceed with lubrication as follows:

(a) Lubricate the gear train and lead screws as indicated in Figure 3-3.

(b) To oil the bearings, dip a length of wire into the oil to collect a small drop at the end, and transfer the oil to the bearing by touching the end of the wire to the edge of the bearings.

NOTE

Apply all oil and grease sparingly. Too much lubrication is worse than none at all.

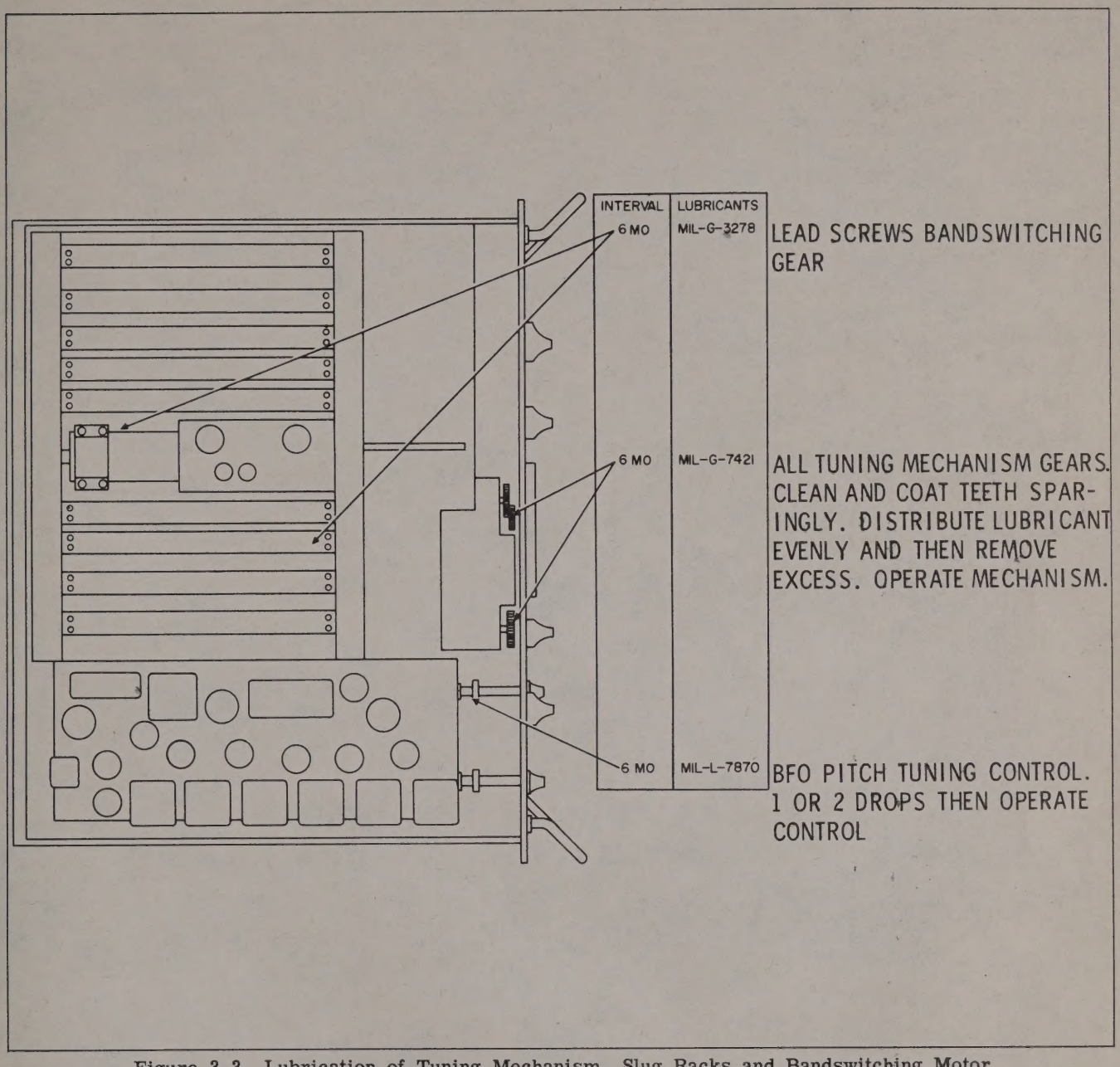
INTERVAL
LUBRICANTS
6 MO
MIL-G-3278
LEAD SCREWS BANDSWITCHING GEAR
6 MO
MIL-G-7421
ALL TUNING MECHANISM GEARS. CLEAN AND COAT TEETH SPARINGLY. DISTRIBUTE LUBRICANT EVENLY AND THEN REMOVE EXCESS. OPERATE MECHANISM.
6 MO
MIL-L-7870
BFO PITCH TUNING CONTROL. 1 OR 2 DROPS THEN OPERATE CONTROL

Figure 3-3. Lubrication of Tuning Mechanism, Slug Racks and Bandswitching Motor

(c) Use a standard grease gun and a thin long-handled brush to apply the grease to the points indicated in Figure 3-3.

(3) Reassemble RF subchassis as instructed in Routine 1.3(4).

g. Replace RF subchassis shield, and top and bottom dust covers on the receiver.

h. Replace receiver in rack or mounting from which it was removed in step 4.c.

i. Reconnect all cables and wires disconnected in step 4.b.